ELECTRICAL REVIEW

[illegible] APRIL 1958 PRICE 1s 6d

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MAY 13 1958

The success of recently introduced designs of Ellison Switchgear, owes much to continuous research and exhaustive tests carried out at our own A.S.T.A. Authorised Testing Station. Constant access to these facilities ensures that new designs released in the future will maintain the Ellison reputation for reliability. Thus we are able to "continue a tradition"—that the performance of Ellison Switchgear when it reaches the user shall be as near perfection as research, skill and testing can make it.

[illegible]WARDS PERFECTION

GEORGE ELLISON LIMITED BIRMINGHAM ENGLAND

Continuing a Tradition

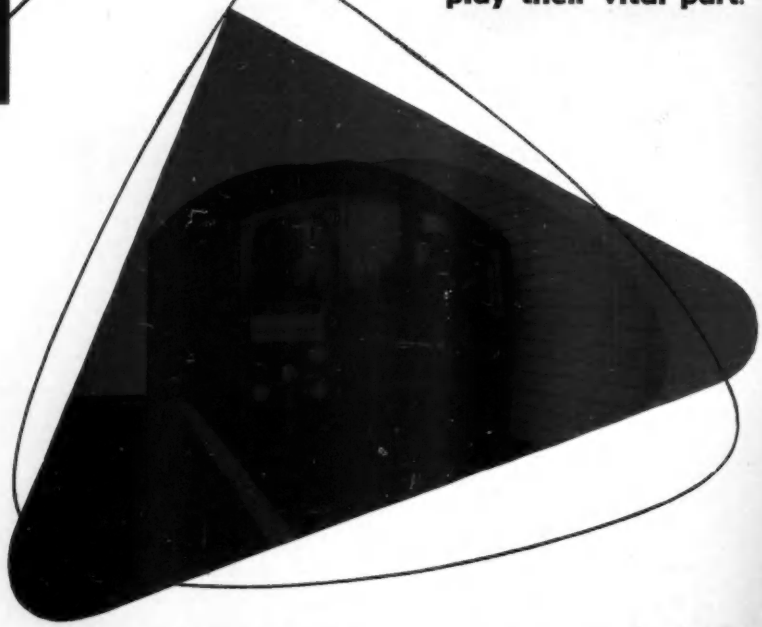
777

above and below ground

Our insulating materials play their vital part.

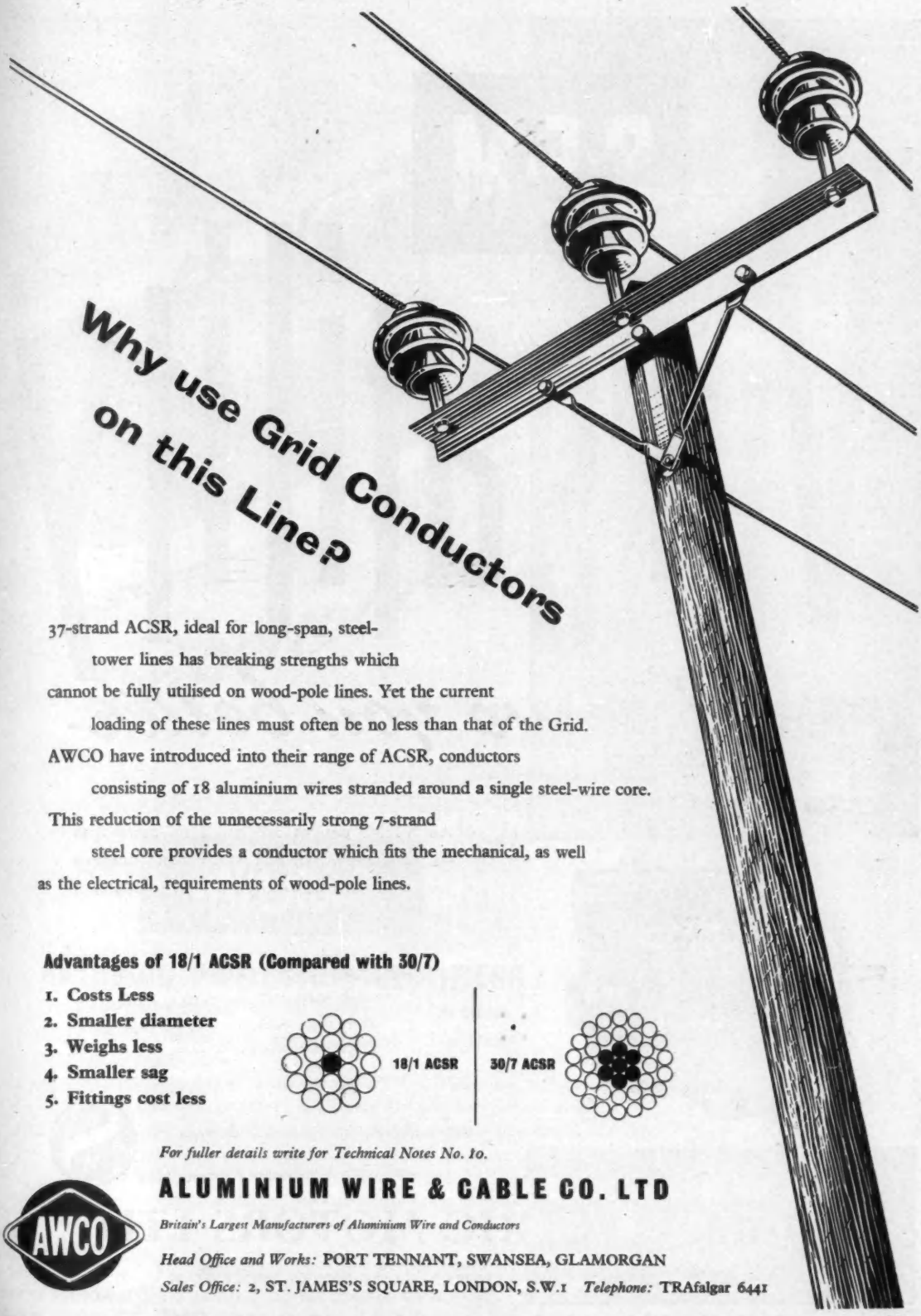
m and i

the electrical insulation people



TOP PHOTO By Courtesy of C.E.G.B.
LOWER PHOTO By Courtesy of London Transport Executive

THE MICANITE & INSULATORS CO. LTD., WALTHAMSTOW, LONDON, E.17
Telephone: Larkswood 5500 Telegrams: Mytilite, Easphone, London



Why use Grid Conductors on this Line?

37-strand ACSR, ideal for long-span, steel-tower lines has breaking strengths which cannot be fully utilised on wood-pole lines. Yet the current loading of these lines must often be no less than that of the Grid. AWCO have introduced into their range of ACSR, conductors consisting of 18 aluminium wires stranded around a single steel-wire core. This reduction of the unnecessarily strong 7-strand steel core provides a conductor which fits the mechanical, as well as the electrical, requirements of wood-pole lines.

Advantages of 18/1 ACSR (Compared with 30/7)

1. **Costs Less**
2. **Smaller diameter**
3. **Weighs less**
4. **Smaller sag**
5. **Fittings cost less**

For fuller details write for Technical Notes No. 10.

ALUMINIUM WIRE & CABLE CO. LTD

Britain's Largest Manufacturers of Aluminium Wire and Conductors

Head Office and Works: PORT TENNANT, SWANSEA, GLAMORGAN

Sales Office: 2, ST. JAMES'S SQUARE, LONDON, S.W.1 *Telephone:* TRAfalgar 6441

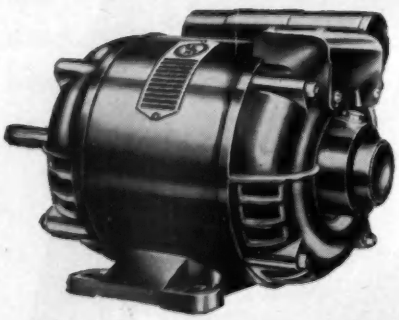
AP46

A

S·E·M

Versatility

will serve you better



All S.E.M. designs are based on more than 40 years' experience and with modern machine tools and strict inspection, a high standard of production is assured.

We offer :—

Single phase A.C. motors up to 2 H.P.
Three phase A.C. motors up to 10 H.P.
Fractional horse power D.C. motors.

Contractors to all Government Departments

EST SEM 1914

SMALL ELECTRIC MOTORS LTD

BECKENHAM, KENT Tel. : Beckenham 0066 & 1152
WORKS : EAGLE WORKS, BECKENHAM
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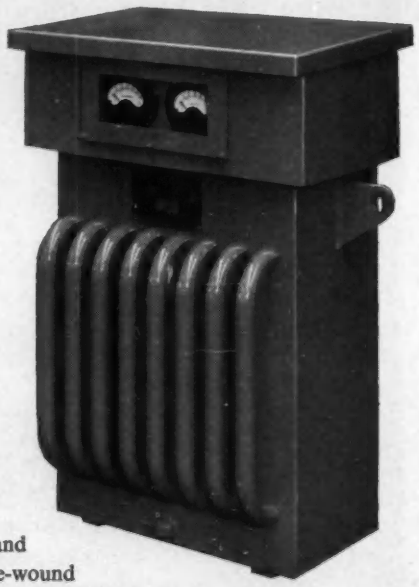
for better cathodic defence -

specify

DAVENSET



CATHODIC PROTECTION RECTIFIERS

for protecting pipelines and all underground structures ; ships' hulls, jetties and similar marine installations.

An extensive range of DAVENSET oil-filled mains-operated Rectifiers is available to suit every location and type of installation. These rectifiers embody a double-wound vacuum-impregnated transformer and full-wave selenium metal rectifier. These components are sealed in an oil-filled tank. Input and output fuses, control switches, ammeter, volt-meter and cable terminations are mounted in a drip-proof gasket sealed cubicle. Built for rugged outdoor service in all climates.

Field survey by specialist engineers available — for full information write to :—

PARTRIDGE, WILSON & CO. LTD., Davenset Electrical Works • Leicester

MEM motor control gear helps to make so many things

These Lotus shoes for instance

The Lotus shoe factory in Northampton is one of the most modern in the country. For this reason you will find it is extensively equipped with MEM motor control gear and switchgear. Nearly every working bench, for example, has a MEM motor starter. Most of the leading industrial concerns are big users of MEM equipment. This is not surprising when you remember that MEM are leaders in their own field too. MEM equipment is very simple and robust in design. It is extremely reliable in performance, easy to maintain and offers today's best value for money.

The final assembly section of the MEM Tyseley works where castings, pressings, mouldings and other components meet to make the finished product.

MEM MIDLAND ELECTRIC MANUFACTURING CO. LTD · TYSELEY · BIRMINGHAM 11

B T-H

DIESEL-ELECTRIC LOCOMOTIVES

FOR MAIN LINE SERVICE

As part of their far-reaching modernisation plans, British Transport Commission called upon BTH to supply ten 800-h.p. diesel-electric locomotives for main-line freight duty. The illustration shows the first of these locomotives on test.

BRITISH THOMSON-HOUSTON

THE BRITISH THOMSON-HOUSTON COMPANY LIMITED · RUGBY · ENGLAND

an A.E.I. Company

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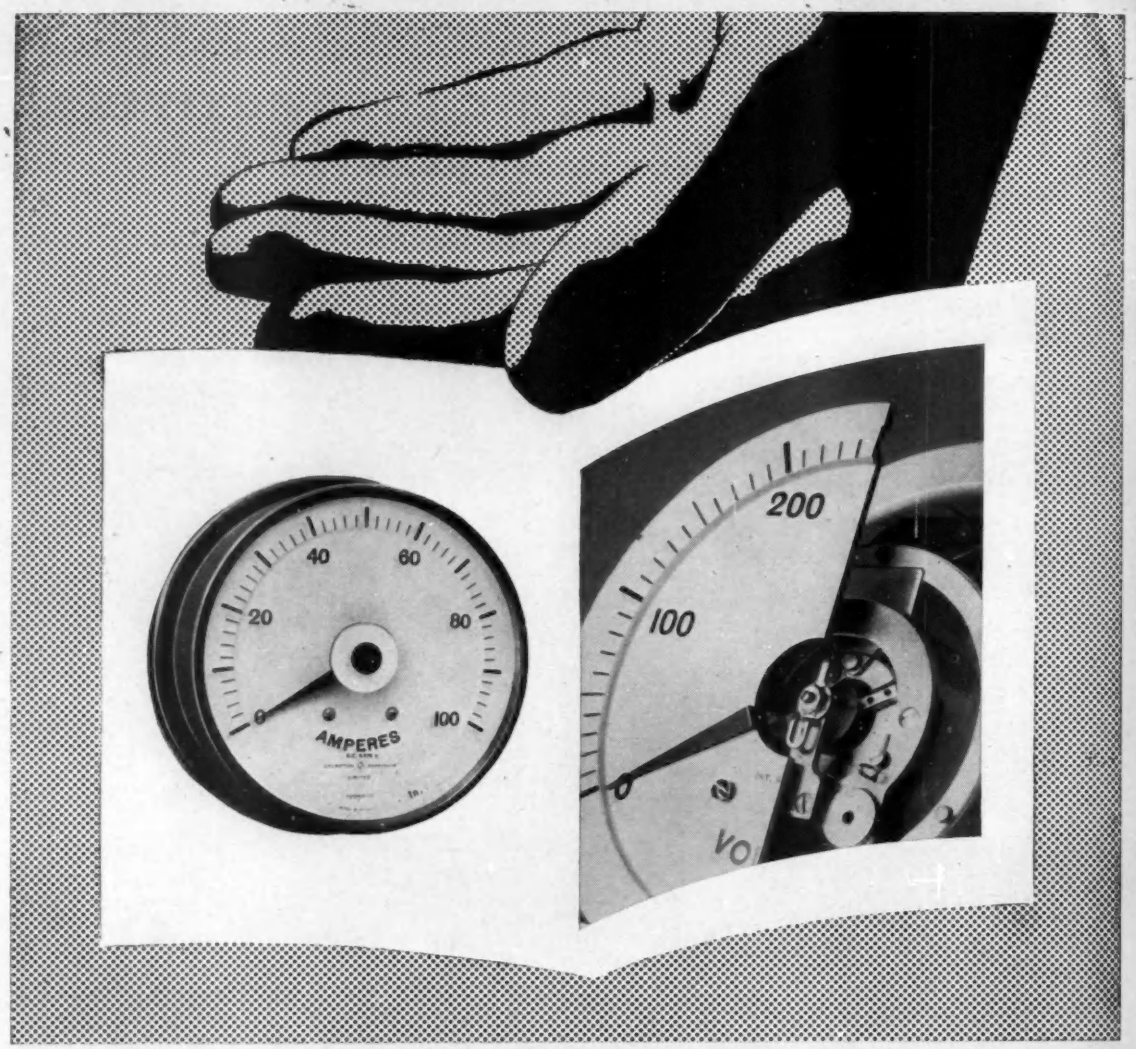

Useful accuracy is accuracy you can read

Crompton Parkinson instruments are accurate instruments—every one is hand calibrated against a master. And to give the eye a chance to make use of that accuracy these circular scale instruments *stretch* the scale—ten inches of clear and open markings on a 6-in. diameter dial.

Because the pointer moves in the same plane as the scale markings parallax errors are eliminated. Even at an oblique angle—on a panel above eye level for instance—you can still read this instrument *accurately*. And now the circular scale is available on a wide range of portable instruments also.

Crompton Parkinson LIMITED

Member of the Nuclear Power Consortium:

ATOMIC POWER CONSTRUCTIONS LTD

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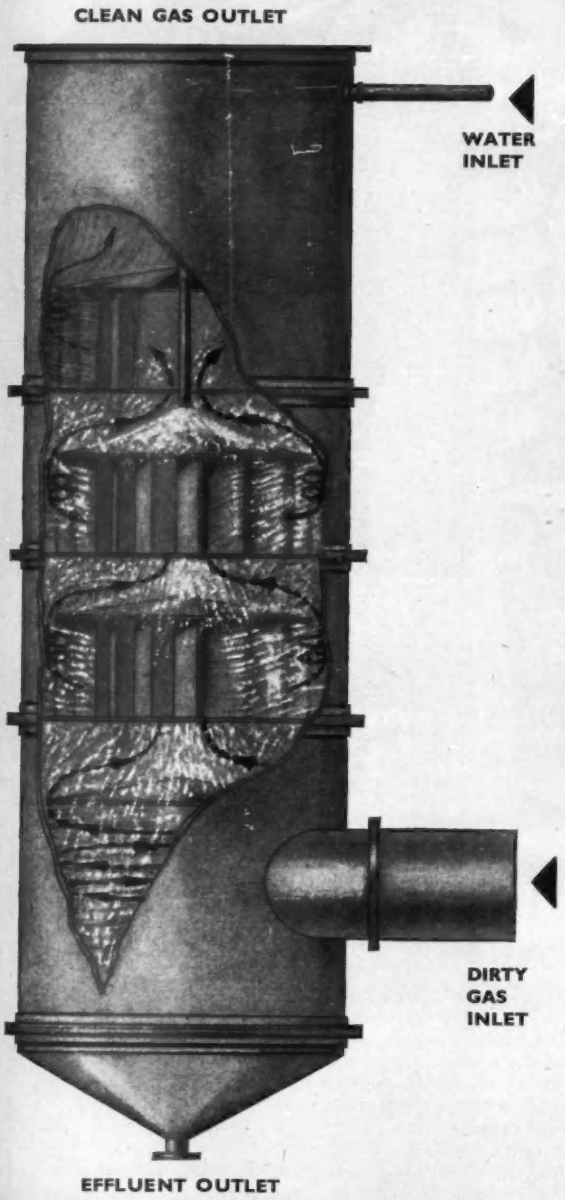
CROMPTON PARKINSON LIMITED, CROMPTON HOUSE, ALDWYCH, LONDON, W.C.2.

STURTEVANT PLANT for CLEAN AIR



The "WALBROOK" SCRUBBER

This scrubber is of advanced design and will collect dust at very high efficiencies — even the most difficult and fine dusts can be efficiently separated.

A series of cleaning stages is embodied in a compact vertical cylindrical casing. At each stage a powerful turbulent action intermixes the water with the dust-laden gas.

There are:

- **No internal moving parts.**
- **No nozzles, sprays or other parts requiring adjustment.**

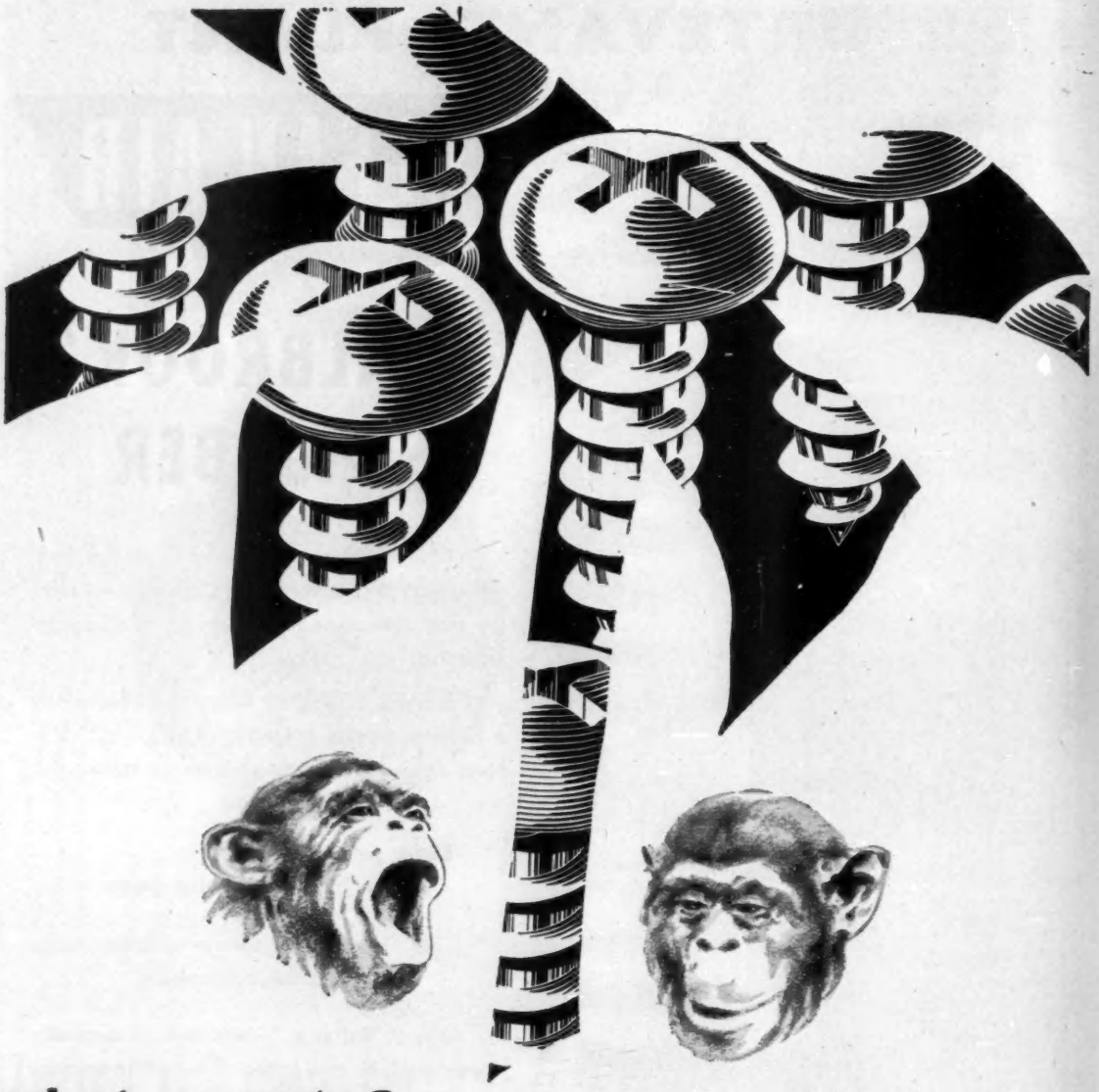
The "Walbrook" Scrubber is normally constructed in steel plate, but other materials, depending upon the nature of requirements, can be employed.

Further particulars may be obtained by writing to our reference U/101/W.

STURTEVANT ENGINEERING CO. LTD.
Southern House, Cannon Street, London, E.C.4

AUSTRALIA

STURTEVANT ENGINEERING CO. (AUSTRALASIA) LTD. 400, SUSSEX STREET, SYDNEY, N.S.W.



what, no nuts? . . .

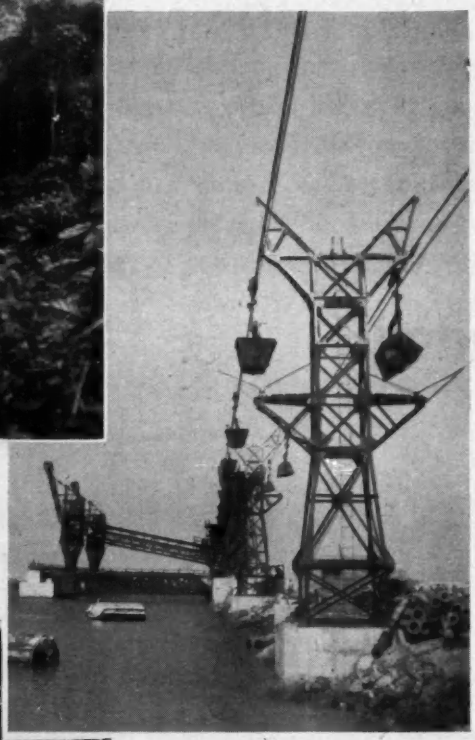
Nuts to use nuts? Well, not exactly, but the fact that the Tapping Screw obviates the use of nuts is just one of its distinct advantages over the conventional Machine Screw. There's the saving in time to consider too. And cost. And there's no doubt whatever that the tapping screw makes for a better job all round. With its self-locating point the tapping screw forms its own thread thereby eliminating a separate and expensive tapping operation. Obviously it makes for easier assembly, is stronger, cheaper and faster. Safer too when the Phillips recessed head is specified, designed for power driving without damage to worker or job. You'll be well advised to change over to Tapping Screws. Nothing nuts about that !

Linread

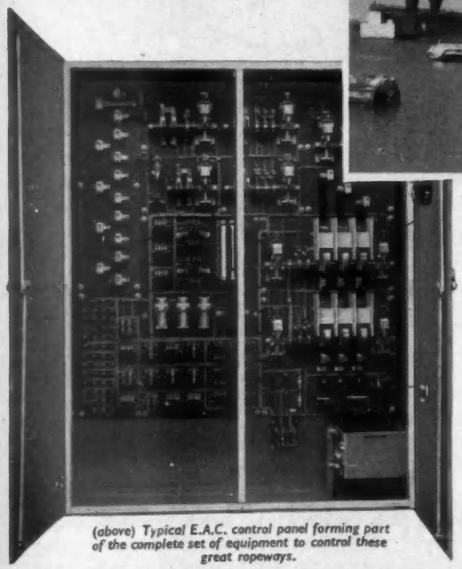
LINREAD LTD. COX ST. BIRMINGHAM 3

SLOTTED AND PHILLIPS RECESSED HEAD MACHINE SCREWS AND TAPPING SCREWS • HIGH TENSILE HEXAGON HEAD BOLTS AND SETSCREWS AIRCRAFT BOLTS, SCREWS AND RIVETS • SEMS • RIVNUTS • CUSTOM DESIGNED COLD FORGED FASTENERS • ALEX SCREWPLUGS.

BRECO ROPEWAYS *with* EAC CONTROL



(above and right) BRECO ropeways in remote corners of the world are transporting vast loads of material across many miles of terrain.



(above) Typical E.A.C. control panel forming part of the complete set of equipment to control these great ropeways.

▶ Large scale aerial ropeways on a variety of applications throughout the world planned and supplied by the British Ropeway Engineering Co. Ltd. are controlled by E.A.C. control equipment.

In all cases this E.A.C. gear is giving exemplary service in many exacting and complicated duties.

E.A.C. are the ORIGINAL Singlephasing Preventor People.

THE ELECTRICAL APPARATUS COMPANY LTD. EAC ST. ALBANS

short-handed?

Only *one* pair of hands is required to operate the Azoflex model 42/63 to produce prints in large quantity—dried, flat and ready for immediate trimming and collating. No darkroom, no elaborate ventilating system and ducting are necessary as there are no unpleasant fumes, and therefore AZOFLEX machines are completely mobile to facilitate reorganisation or expansion. Exposing, developing and print delivery are all synchronised for an even flow of finished work, and output in excess of 100 20″×30″ prints per hour can easily be achieved. AZOFLEX is the *only* daylight reflex copying process and it is the *only* photoprinting process to apply a measured dose of developer, thus ensuring optimum quality.

The majority of AZOFLEX photoprinting machines can, subject to certain conditions, be hired as an alternative to outright purchase, where this is preferred.

AZOFLEX MODEL 42/63. Combined synchronised printer and developer. Capacity: cut sheets and rolls up to 42 in. wide. Printing speed: from 6 in. to 15½ ft. per minute. Dimensions: Height 52 in. Width 67½ in. Depth 52 in. with delivery tray extended. Weight: approximately 850 lbs.

ILFORD *Azoflex*

Enquiries to:
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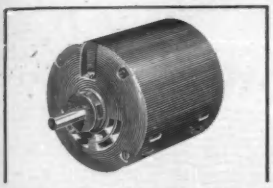
Industrial Sales Dept. AZ14F
Ilford, Essex
Telephone : Ilford 3000

MACHINES AND MATERIALS FOR DRAWING OFFICE PHOTOPRINTING



The "Merlin." A motor for the appliance and machine maker. A special washing machine type is available.

The "Gryphon." An industrial fractional in a wider range, offering greater flexibility.

The "Gryphon." With resilient mounting for quiet running. A feature available for most types in the range.

The "B.S.42." Smaller in size than the others, this motor is useful where space is limited.

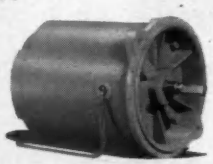
Where can you find a better fractional?

If you have light machines or appliances to drive... BROOK has a motor to meet your most exacting specification. Output, size enclosure and mounting method are factors to be considered along with competitive price. Where indeed can you find such a variety of small power packs? Where can you get technical help in making your selection?

BROOK of course!

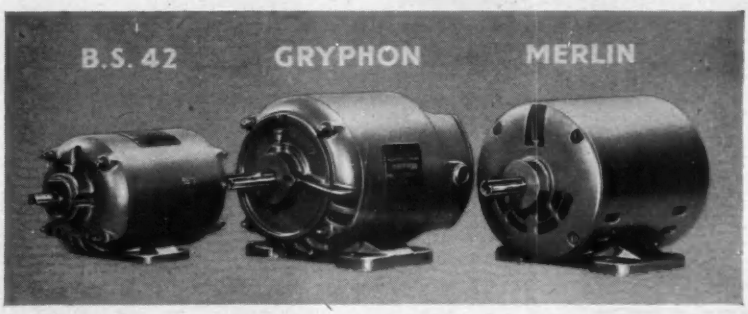
❋ Write for full technical details

★



"MERLIN" OIL BURNER FLANGE MOTOR

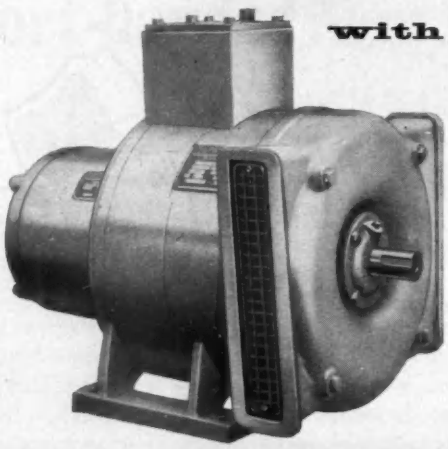
A new addition to the range. Available in the usual range of outputs.



BROOK MOTORS LIMITED
HUDDERSFIELD

5716

400~



with inherent voltage regulation, and good wave form

"Magnicon" Alternators producing 400 cycle supplies are now available. These machines with full "Magnicon" control have an inherent voltage regulation of ± 2½% together with an excellent wave form under any combination of resistive, inductive and/or rectifier load. Early delivery can be given for standard machines.

MAGNICON
400~

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When it comes to electrical repairs, the expression 'know-how' means a great deal of accumulated experience in an endless variety of applications. Added to that must be equipment and facilities on a large scale and test instruments of every kind. And if you multiply all that by fourteen works you have the B.E.R.L. Service Organisation—the largest electrical repair company in Great Britain.

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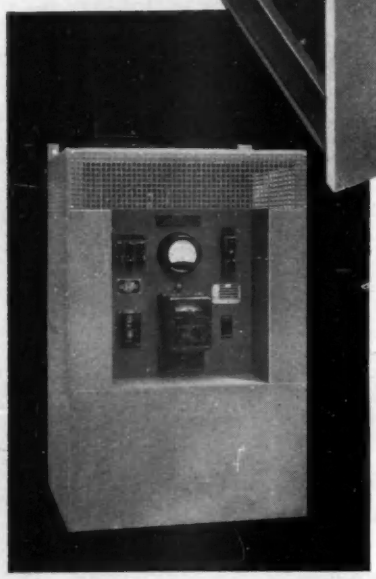

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Should you need really well designed, economic, dependable equipment for the supply of D.C. from A.C. mains; equipment that is produced with an eye to quality, it will be well worth your while to send an enquiry to Crypton of Bridgwater. This progressive Lancashire Dynamo company has earned an enviable reputation throughout the world not only for the pre-eminence of its products but also for its prompt, courteous and reliable service.

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YOUR WORLD BRIGHTER
IT'S THE
QUALITY
THAT COUNTS
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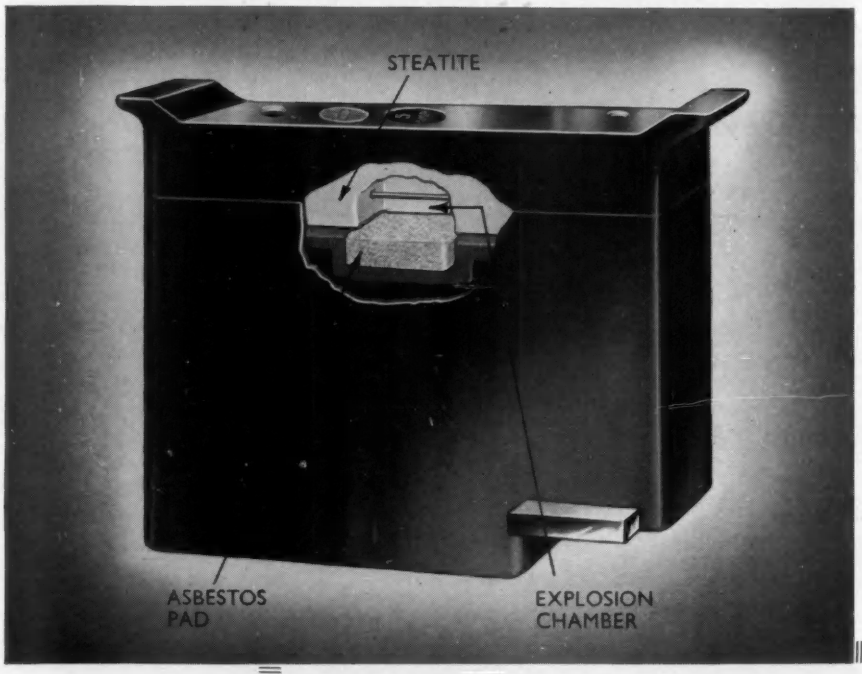
CROFT WORKS, MOORE PARK ROAD, LONDON, S.W.6 · Phone: RENOWN 7181—5 lines
Manufacturers of High Grade Fluorescent Control Gear

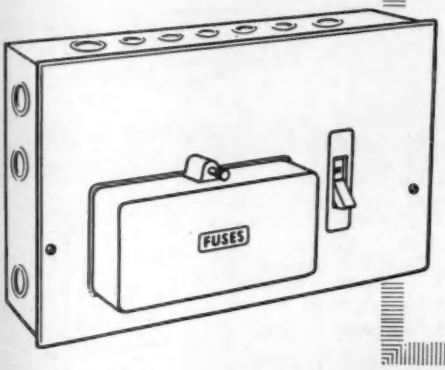
"Little Things mean a lot"



THE WYLEX FUSE
is so designed that the hottest part of the fuse wire is in an enclosed chamber. So, probability of the rupture is in the chamber.
One of the little things that make Wylex Units
WORTH A LOT MORE

Wylex

Switch Fuse Control Units



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Any combination of 5, 15 and 30 amp Fuses
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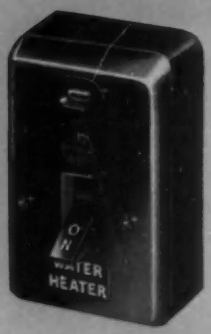
Brown or Cream—with or without Pilot Light—All-insulated or Metalclad

PILOT SWITCHES
with Neon Light



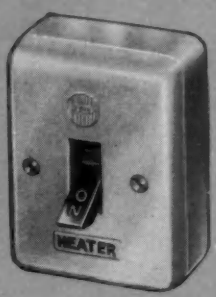
P20A BROWN

P20A CREAM

P20B BROWN

SWITCHES
without Neon Light

821A BROWN

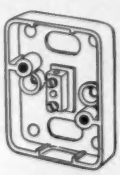


821A CREAM

821B BROWN

EMBOSSING: 4d. LIST PRICE EXTRA

CAT. No.	TYPE WITHOUT PILOT LIGHT	List Price	
		Brown	Cream
821A	Surface All-insulated	5/4	6/0
821B	Sunk Metalclad	12/8	13/4
821E	Surface Metalclad	12/8	13/4
129E	MOULDED PATTRESS with earth terminal for Switch 821A	1/4	2/0



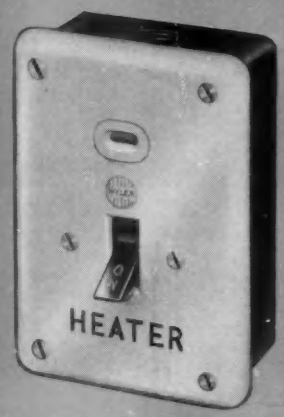
PATTRESS for non-pilot switches

0 AMP SWITCHES

WYLEX

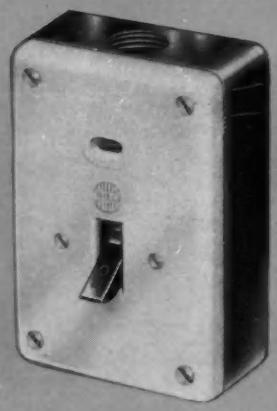
lclad

any switch embossed, if desired, ***"WATER HEATER", "HEATER"*** *or* ***"FLOOR HEATING".***



P20B CREAM

P20E BROWN

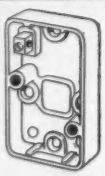


P20E CREAM

821B CREAM

821E BROWN

821E CREAM



PATTRESS for pilot switches

EMBOSSING: 4d. LIST PRICE EXTRA

CAT. No.	TYPE WITH PILOT LIGHT	List Prices	
		Brown	Cream
P20A	Surface All-insulated	11/0	11/8
P20B	Sunk Metalclad	18/0	18/8
P20E	Surface Metalclad	18/0	18/8
186E	MOULDED PATTRESS with earth terminal for Switch P20A	1/4	2/0

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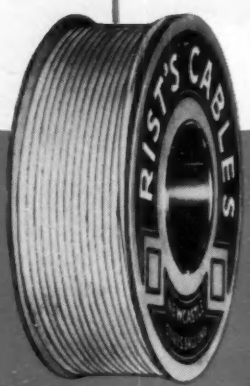

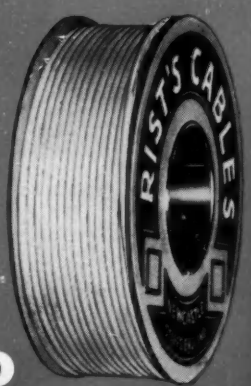

In addition to our wide range of cable manufacture, we specialise in the production of cable assemblies, leads and cords.
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portable & self-contained

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TYPE AVC

SWITCHGEAR

11 kV 150 MVA

A.S.T.A. CERTIFIED

AIR INSULATED
VERTICAL ISOLATION
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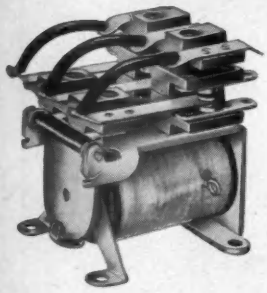
Thorn

Vibration-proof relays

FOR AIRCRAFT AND INDUSTRIAL USE



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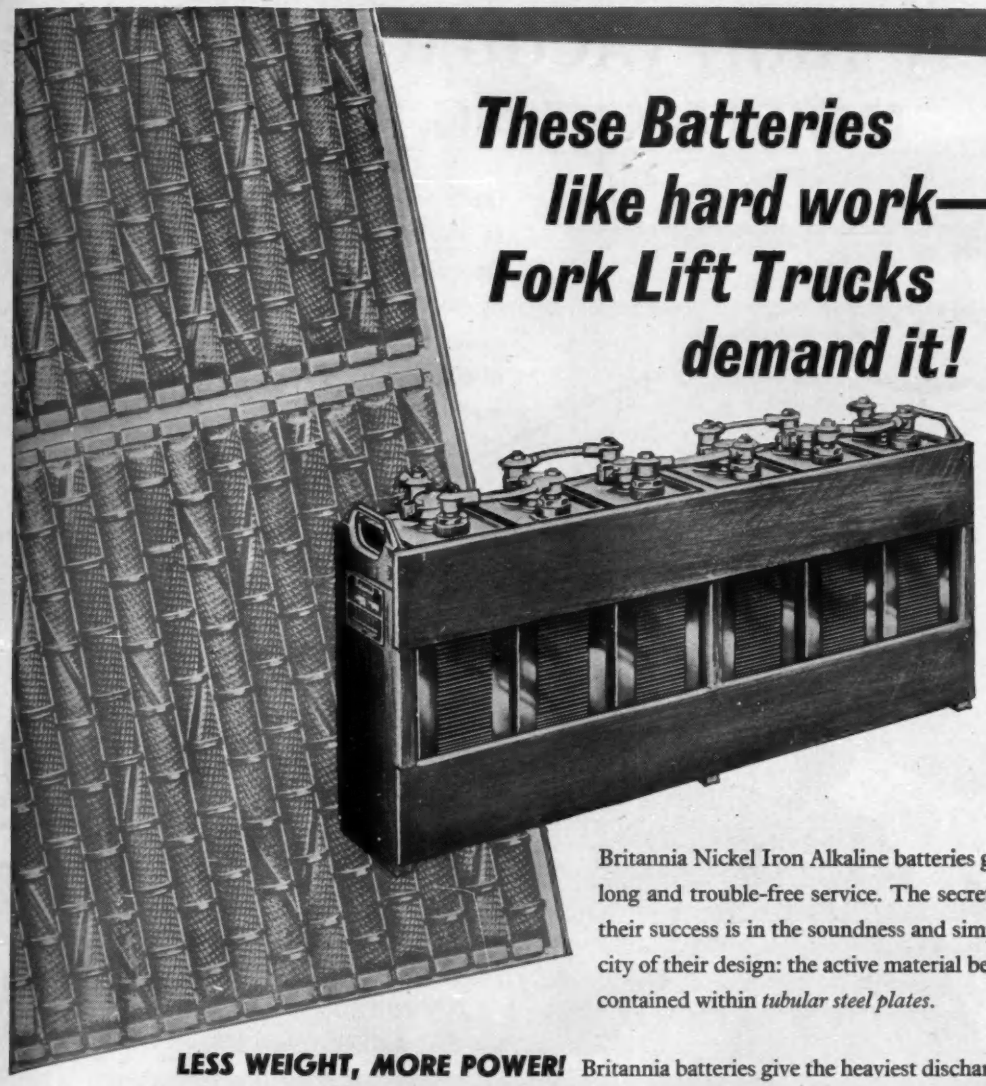

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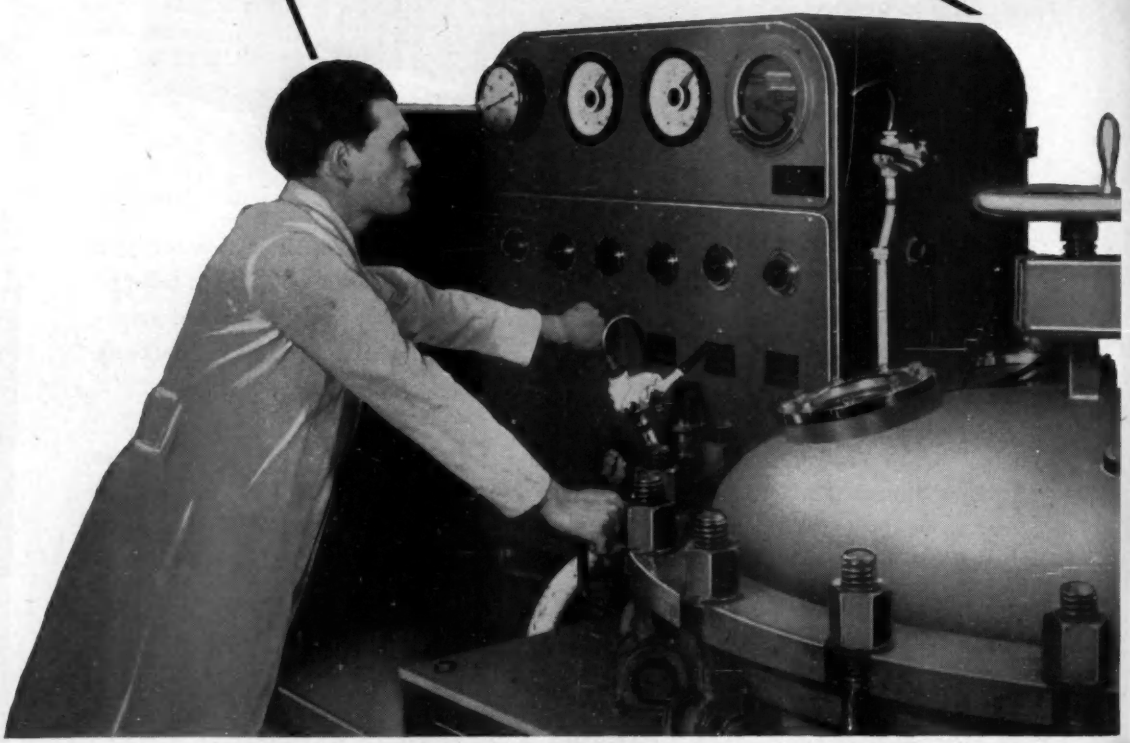

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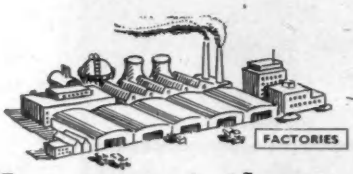

FACTORIES

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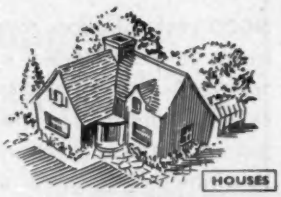

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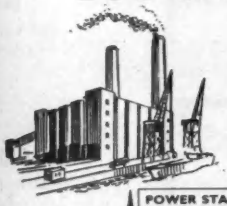

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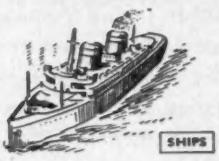

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for ENGRAVED NAMEPLATES—

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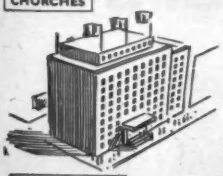

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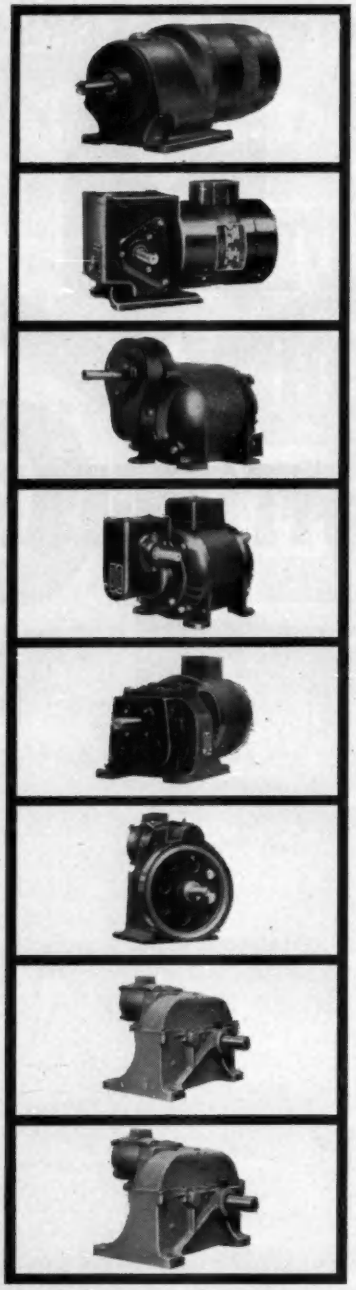
May 7th–17th

a motor for every purpose



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$\frac{1}{8}$ H.P.
312 – 0.079 r.p.m.

SW
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270 – 0.055 r.p.m.

SR
$\frac{1}{4}$ to $\frac{1}{2}$ H.P.
1150 – 350 r.p.m.

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200 lb.-ft.
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800 lb.-ft.
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NECO geared motors cover the whole range of speeds, types, and voltages, three phase, single phase, and D.C. up to 2 H.P. and 1500 pounds/feet torque output. Not so much a range of motors as a range of electrical drives which, within their horsepower limits, can be adapted to run at any speed, to drive any kind of machine, with foot or flange mountings to suit individual requirements.

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Write NOW for a copy of Leaflet No. P 5708 describing and illustrating in detail the unique patented fixing method incorporated in "Cliptite" Ceiling Fittings.

Completely dustproof?

YES!
The "Perspex" dome engages firmly against a felt gasket in the ceiling plate.
Fitted or removed in literally a second, the dome is securely sealed in position by stainless steel bayonet catch fitments. Double springing obviates any trace of backlash.

YES!
definitely dustproof!

Compact and completely dustproof!

The R.E.A.L. "Cliptite" Fitting No. 1222—styled on modern lines and of completely dustproof construction—is ideal for the general overhead illumination of small and medium-size living rooms, entrance halls, corridors, etc,. or for any indoor situation where a well-diffused restful light from above is desired. It is, at present, made in two sizes —60 watt and 100 watt—and specifically for ceiling mounting.

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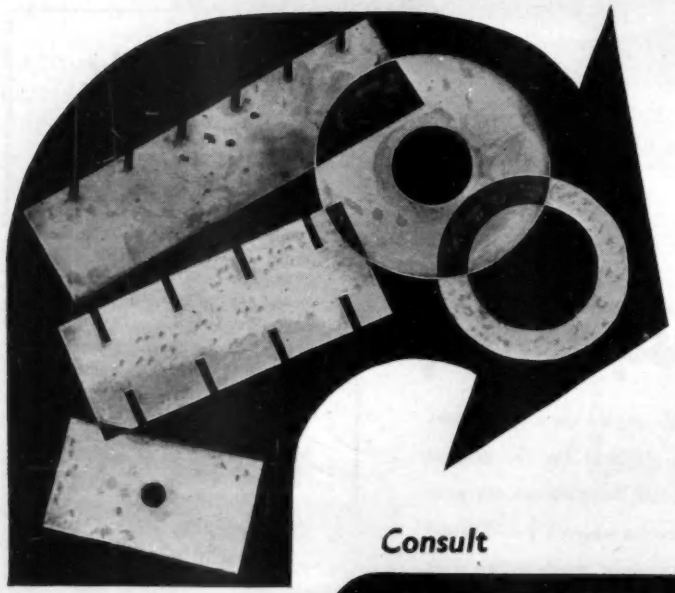

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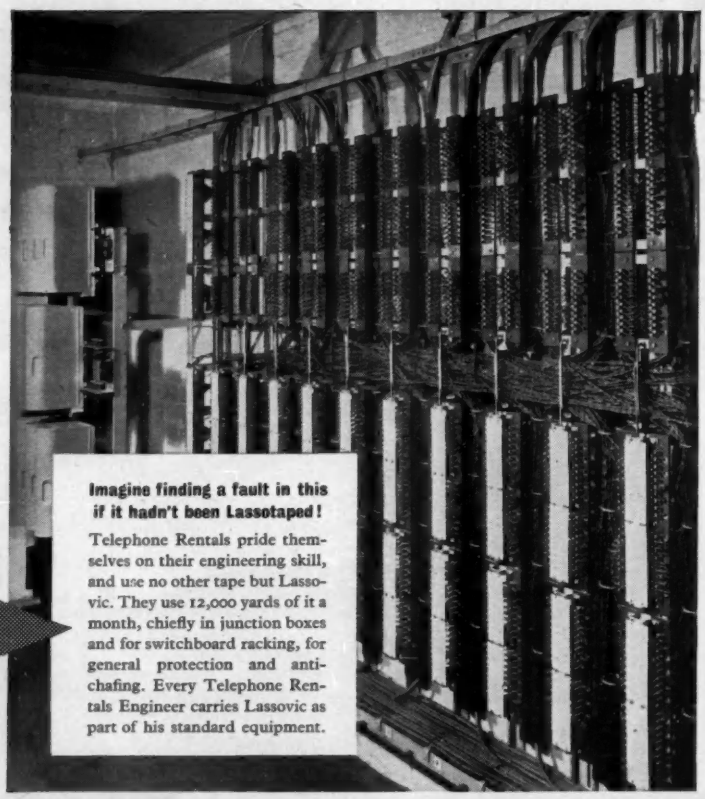

Imagine finding a fault in this if it hadn't been Lassotaped!

Telephone Rentals pride themselves on their engineering skill, and use no other tape but Lassovic. They use 12,000 yards of it a month, chiefly in junction boxes and for switchboard racking, for general protection and anti-chafing. Every Telephone Rentals Engineer carries Lassovic as part of his standard equipment.

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Corrosion is the danger: Lassothene is the answer

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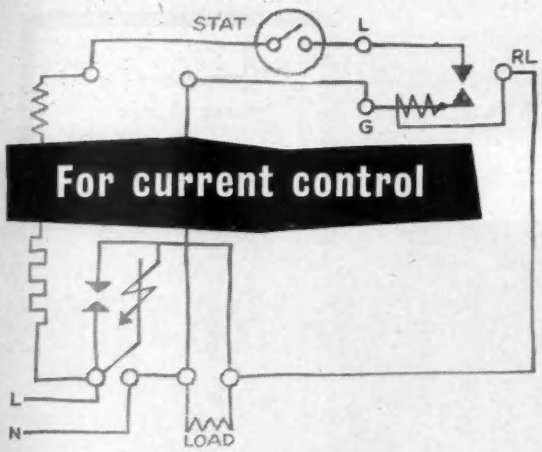

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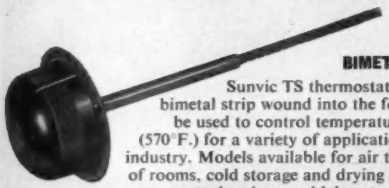
...SPECIFY SUNVIC

Sunvic components are widely used for controlling equipment such as moulding presses, furnaces, incubators, chemical plant, etc. Together with the Sunvic potentiometric recorder they also have numerous applications in scientific and industrial research particularly for measuring, controlling and recording temperature and small electrical quantities.

If you have a specific problem or would like technical information on any or all Sunvic components, please contact Sunvic Controls Ltd., P.O. Box 1, Harlow, Essex. Tel: Harlow 25271.



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Sunvic TS thermostats are operated by a bimetal strip wound into the form of a helix. Can be used to control temperatures of up to 300°C. (570°F.) for a variety of applications in research and industry. Models available for air temperature control of rooms, cold storage and drying chambers, for oven control and general laboratory work, and with a sensitivity of ±1/10°C. for very accurate control.

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The Sunvic energy regulator effects its control by periodically switching on and off the power, the ratio of the on-time to the total time determining the average power input, which is continuously variable. Available in several forms with a continuous rating of 1kW at 230V. A.C.; also supplied with an HVS relay for larger loads.

HOTWIRE VACUUM SWITCH (HVS) TUBES AND RELAYS

Available either as a loose tube for switching up to 10 kW at 400V. A.C. or D.C. or as a complete relay either enclosed in a plastic box or mounted on a paxolin base for incorporation in customer's own equipment. For single—or three-phase A.C. applications. Advantages are: no arcing; silent operation; low, non-inductive operating current; A.C. or D.C.; inductive or non-inductive loads

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Control and research equipment for science and industry

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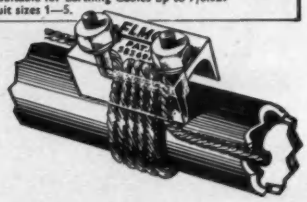
EARTHING CLAMPS

A COMPLETE RANGE TO B.S.951. 1948 IN 4 SIZES

	A123	B45	C67	D0910
for earthing cables up to	7/0.036"	7/0.064"	19/0.064"	19/0.083"
to fit B.S. conduit sizes	1, 2 & 3	4 & 5	6 & 7	8, 9 & 10
i.e. in trade terms	½" to ¾"	1" and 1½"	1½" and 2"	2½" to 3½"

NOTE ALSO: Type A123 is suitable for Earthing Cables up to 7/0.029" and for B.S. conduit sizes 1—5.



"Elmo" Earthing Clamps are of robust construction. Impossible for wire to pull out, always under tension, therefore a most satisfactory earth and a permanent safeguard.

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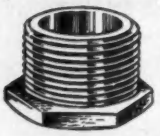
Flexible-to-rigid CONDUIT COUPLINGS

Made in zinc base alloy in the following sizes

Electric Thread (Male)	⅜"	½"	1"	1¼"	1½"	2"
Inside Diameter	⅜"	½"	1"	1¼"	1½"	2"
Electric Thread (Male)		⅜"	½"	1"	1¼"	
Inside Diameter Flexible Conduit		½"	⅝"	¾"	1"	

WITH EARTHING TERMINAL

Special Features: Integral Earthing Terminal, tinned ready for soldering. Fixing screw for continuity. Internal threads suit all makes of flexible tubing.



MALE
Hex. Section

CONDUIT BUSHES

Made in the following sizes:

MALE: Electric Thread
⅜" ½" 1" 1¼" 1½" 2"

FEMALE: Electric Thread
⅜" ½" 1" 1¼" 1½" 2"

FEMALE
Flat Face Section for Spanner (except ⅜" size, which is round)

CONDUIT HOOK

For fluorescent lamps and overhead lighting fittings. Screwed ⅜" thread, male electric.

Made to fit all standard boxes with two holes 7/32" diameter — 2" centres diametrically opposed. Designed in accordance with British Standard Specification.

CEILING PLATE
One hook

Both made in aluminium alloy

Manufactured by M. MOLE & SON LTD.
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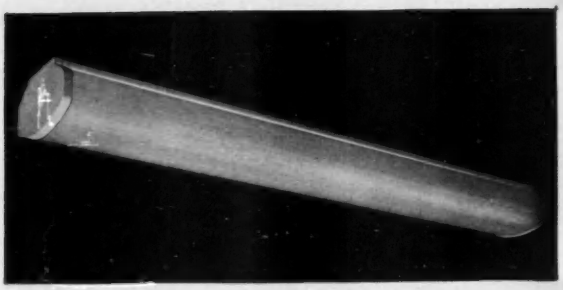
First Choice

Model EP.802
TWIN 80 WATT
Suspended or Ceiling Fitting with Opal Fluted "Perspex" Diffusing Cover



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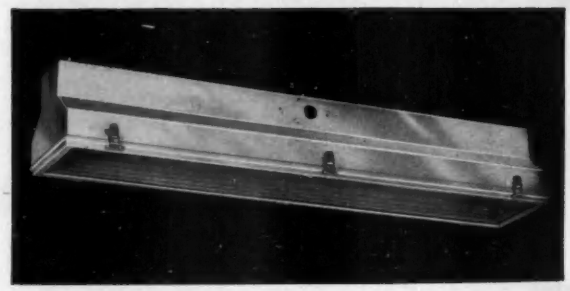
Model VP.802
TWIN 80 WATT
Industrial Vapour-proof Totally Enclosed Fitting suitable for internal or external application.



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Quality Transformers
for all purposes
in silicon steel, grain oriented steel,
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Delivery to customers' requirements

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FOR SPECIAL PURPOSES

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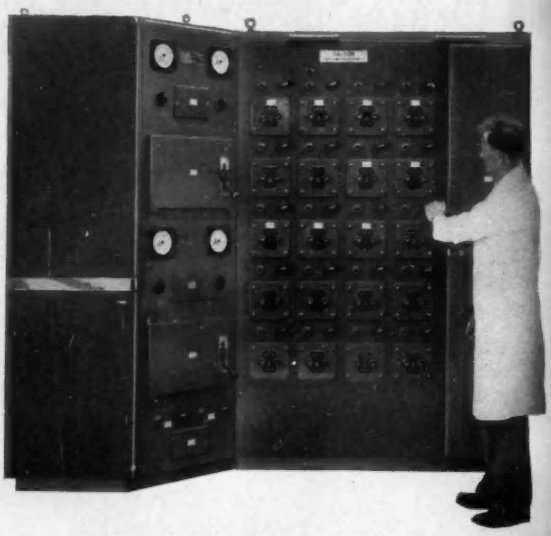

A section of a typical Control Panel made recently

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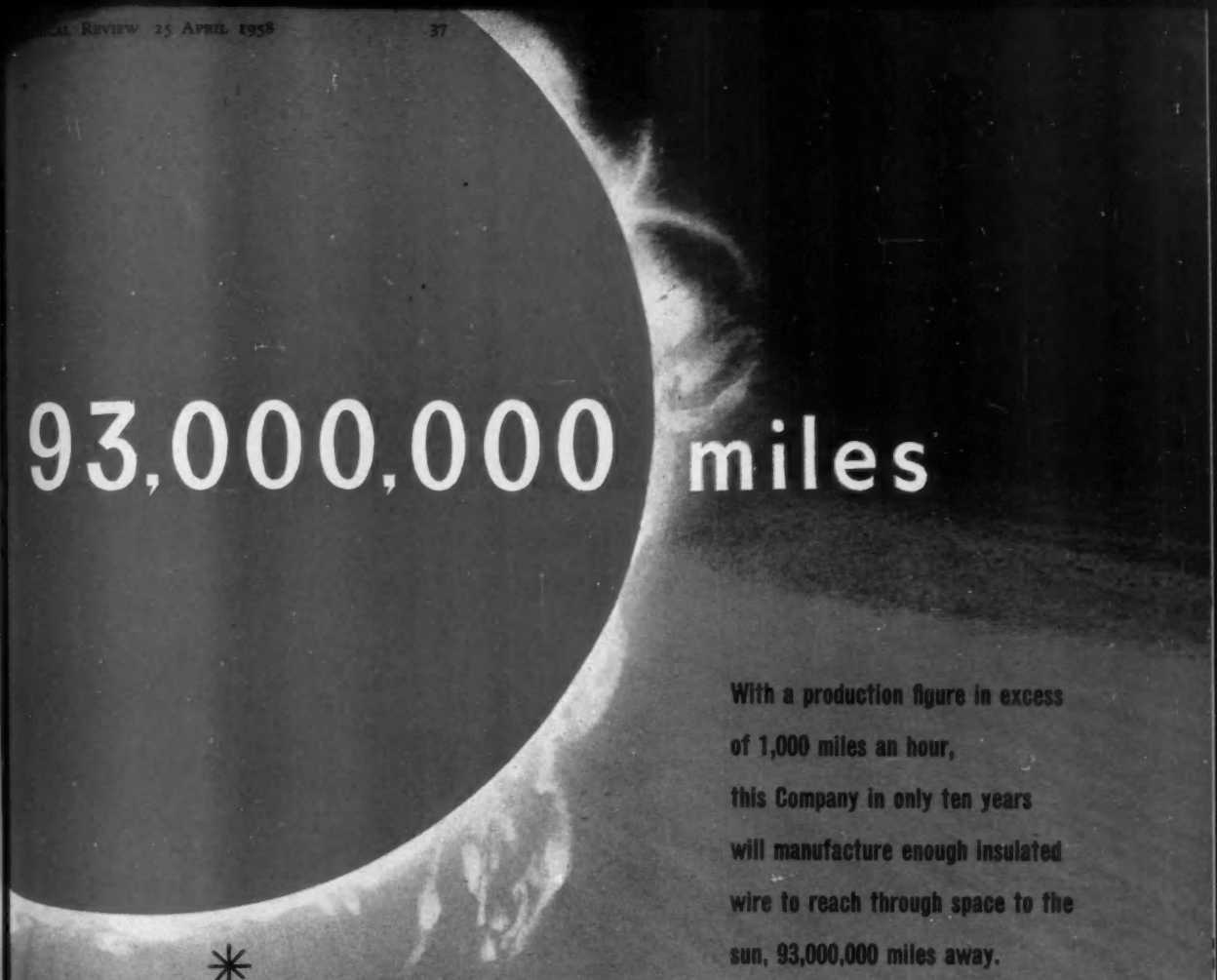

93,000,000 miles

With a production figure in excess of 1,000 miles an hour, this Company in only ten years will manufacture enough insulated wire to reach through space to the sun, 93,000,000 miles away.

✳

During the International Geophysical Year observations of solar activity will be both visual and photographic; by radio methods, cosmic ray 'telescopes' and other specialised equipment, as well as by high altitude balloons and rockets. Measurements of cosmic ray intensity provide an independent means of studying the earth's magnetic field and a furtherance of knowledge in this sphere could be of great importance scientifically

L·E·W

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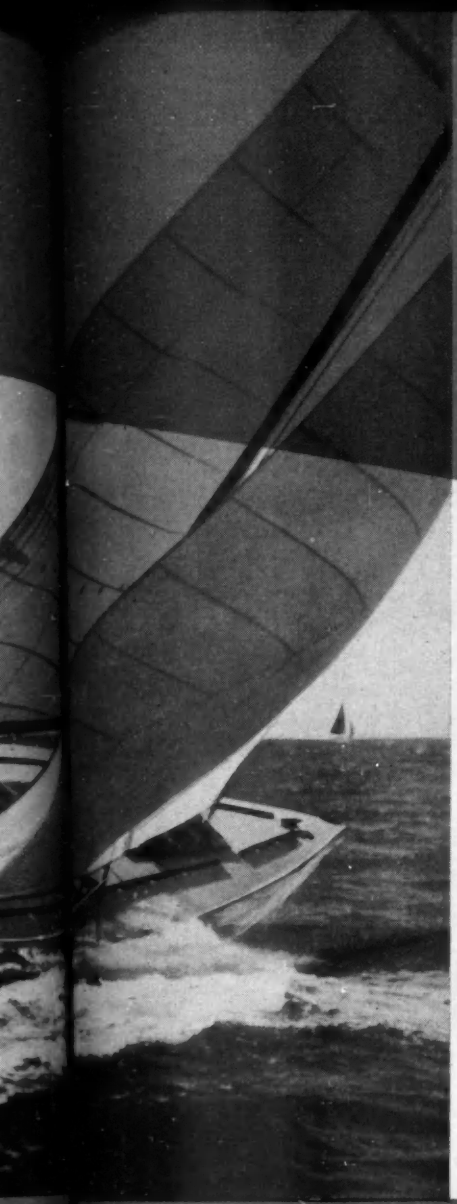
Critical moment, this,

when brain and sinew must work as one to get the most out of the wind! Fast, co-ordinated action is the essence of successful racing sailing—and the secret of the success of Henley service. If you want wiring cables . . . and you want ACTION . . . you want Henley's!



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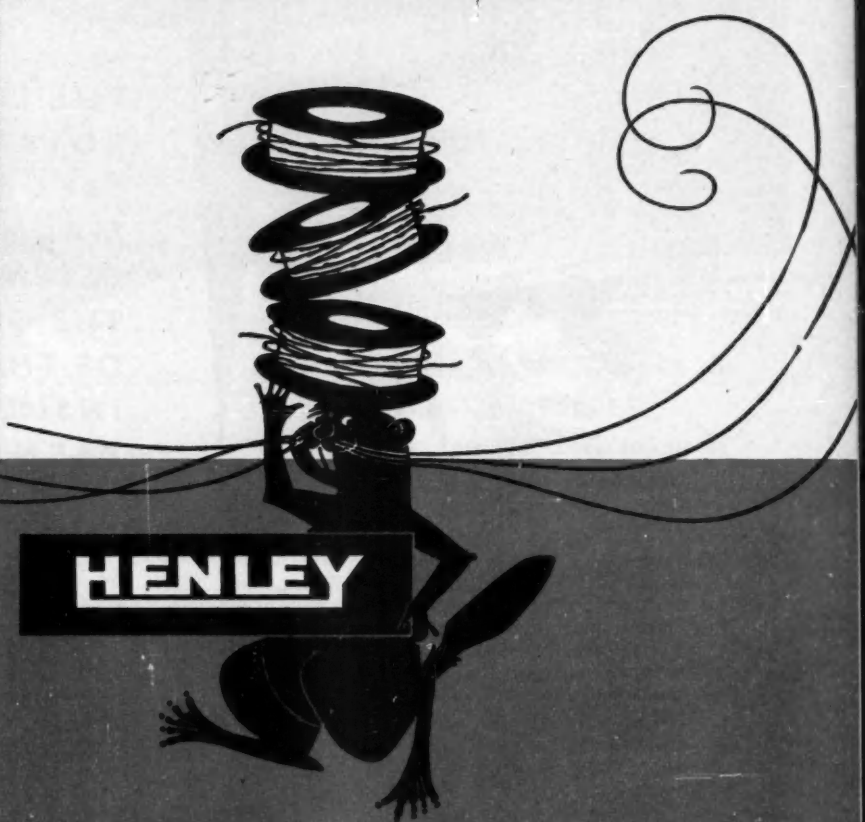
FLEXIBLE CORDS—RUBBER AND PLASTIC

These are but a few of the very wide range of cables and wires we manufacture to cover every electrical need



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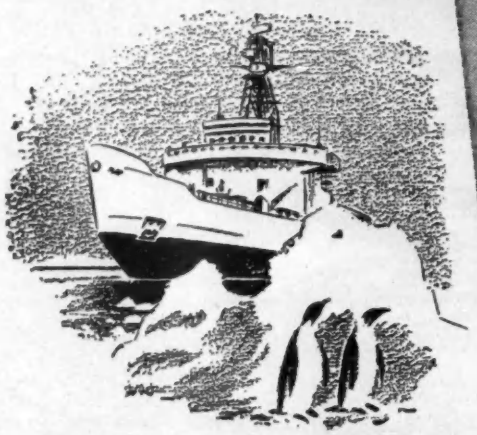

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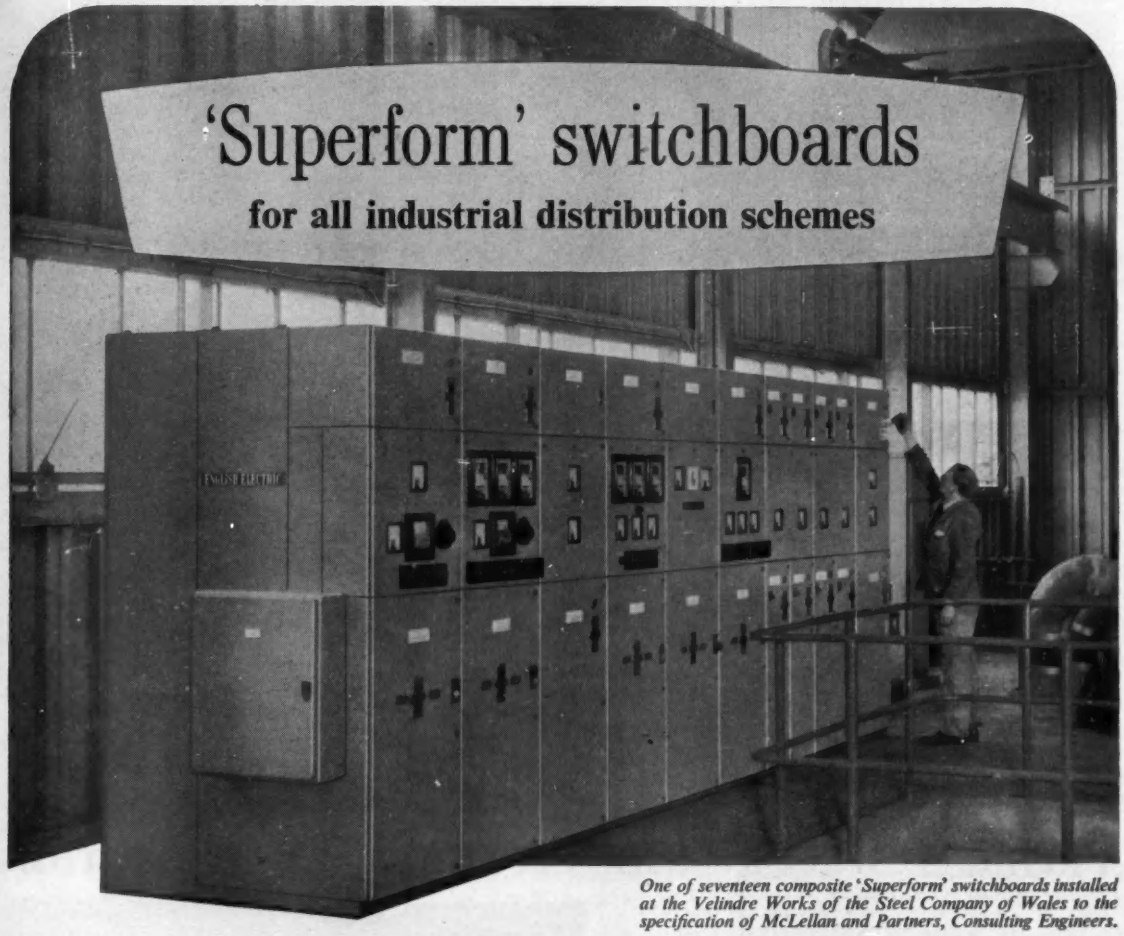
'Superform' switchboards

for all industrial distribution schemes



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Composite boards can be supplied covering all the requirements of modern M.V. systems, the range of equipment including:—

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- ★ Fuse-switches up to 750 amps.
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- ★ Instruments, meters and relays of all types

PLUS

- ★ Modern styling and pleasing appearance
- ★ Unique design features giving increased safety to operating personnel
- ★ Easy access for cabling and maintenance
- ★ Fault making capacities up to 50 MVA at 440 volts
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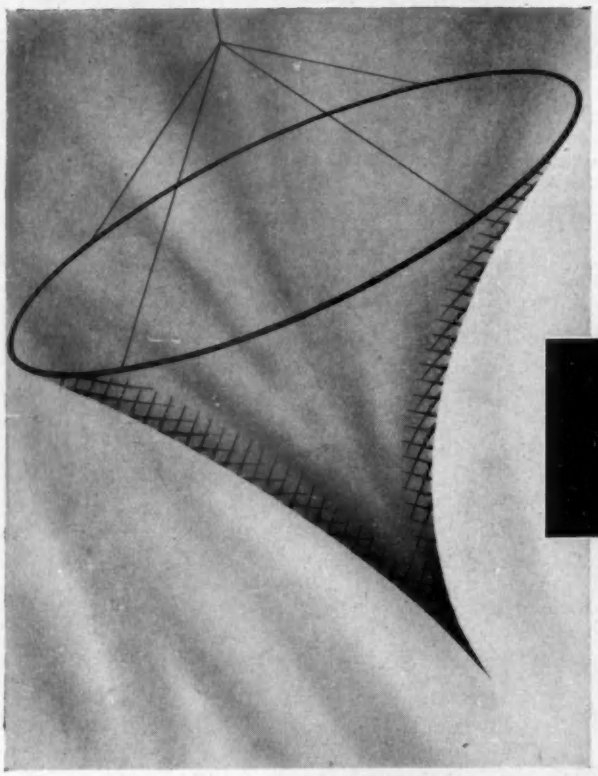

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PROCESS WATER AND EFFLUENT CLARIFICATION

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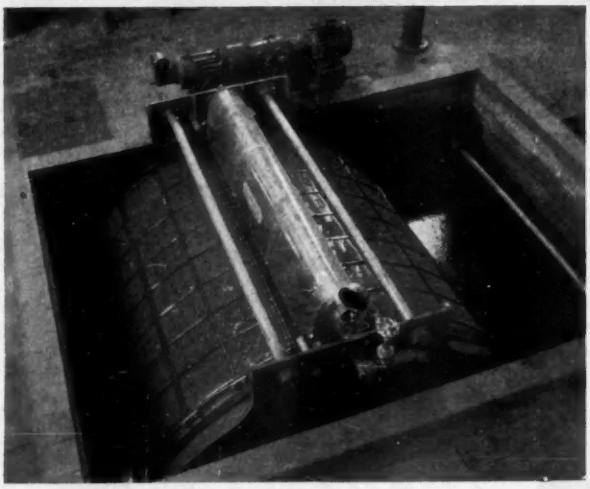

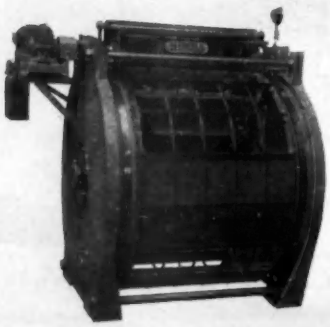

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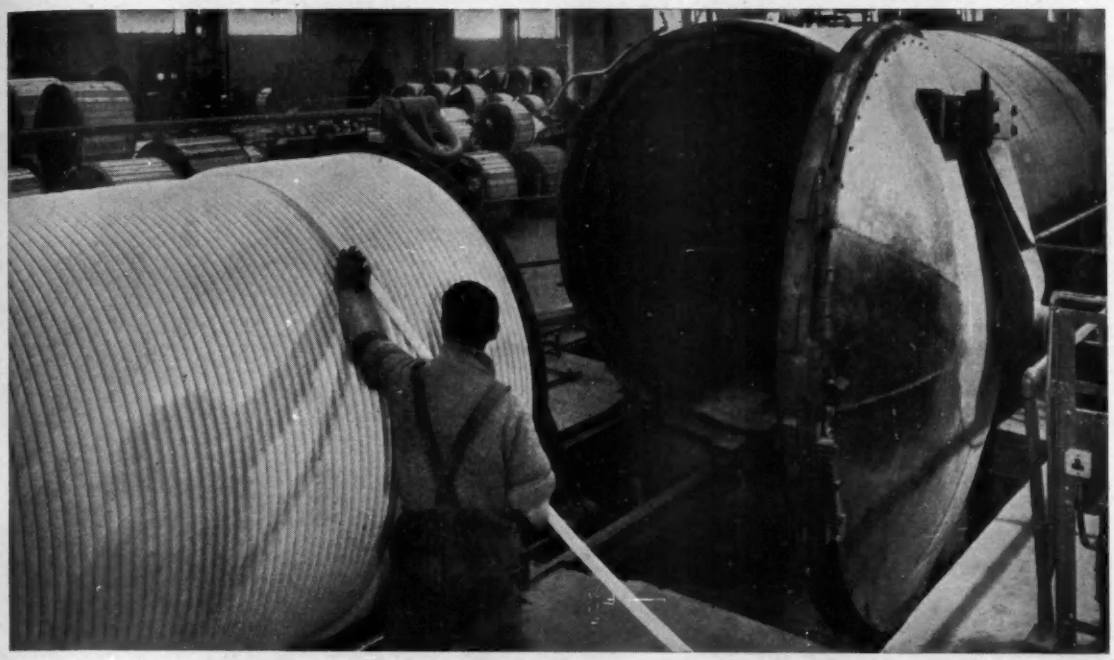
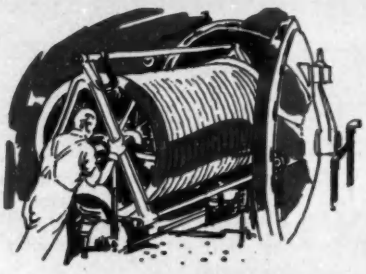


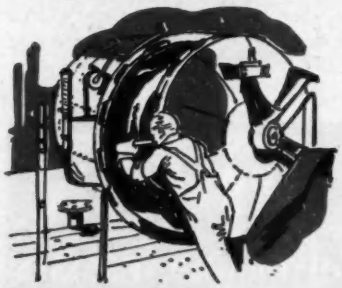
Pressure cooking for large rubber cables!

BICC Rubber Cables are good for years of service, due to the careful formulation of the compounds used and the scientific control exercised during vulcanisation. This is how large cables are processed.

Following insulation or sheathing by extrusion the cables are wound on to a cylinder. The cylinder is then moved into the vulcaniser, where it is subjected to steam under pressure. The temperature is slowly brought up to 145°C, under which conditions the sulphur and rubber combine to produce a vulcanised, tough, resilient covering. During vulcanisation of these large cables the cylinder is rotated inside the vessel so that in the initial stages of heating, deformation due to flow under the weight of successive layers of cable is avoided.

Basically—steam pressure cooking with strict time and temperature control . . . one of the techniques which ensure that BICC Cables will never let you down.





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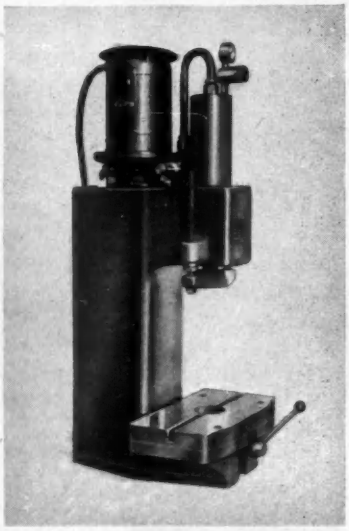

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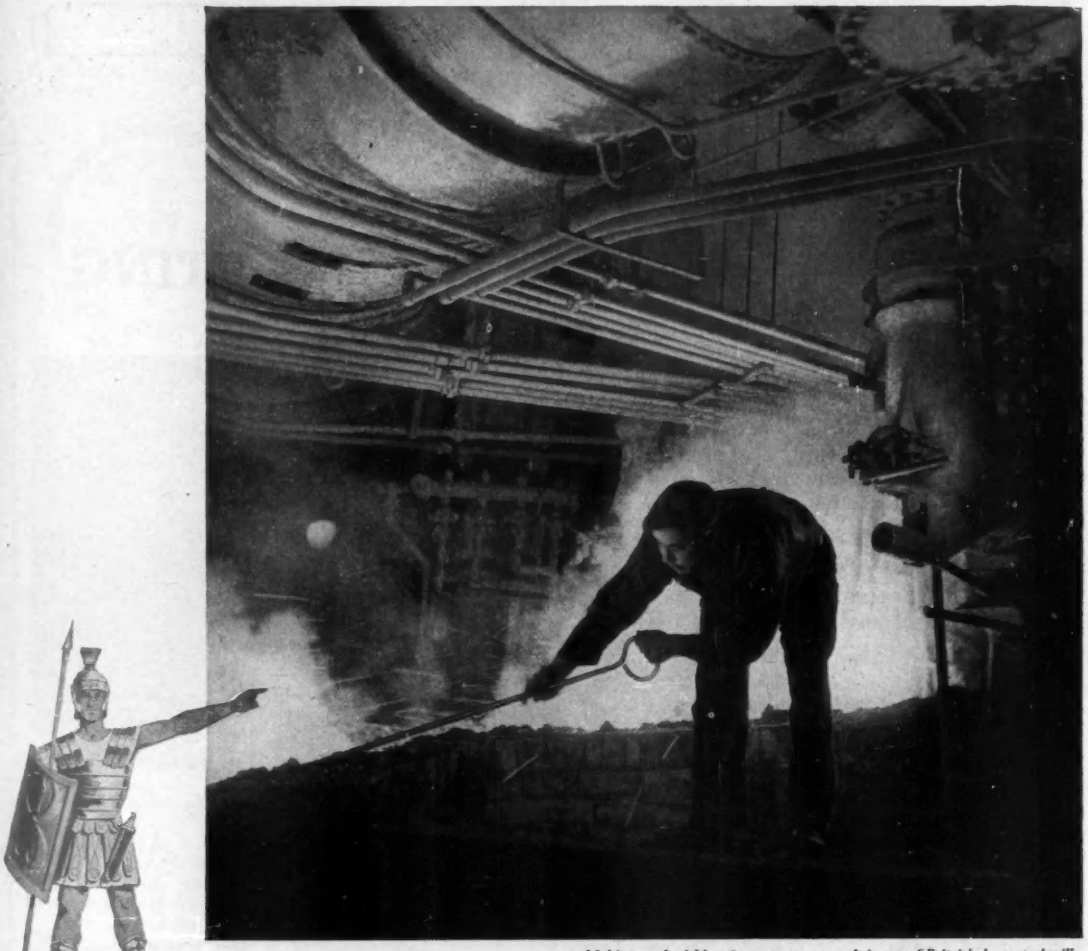

Making steel. A blast furnace man at work in one of Britain's busy steel mills.

C.M.A. Cables at work

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- **Impregnated and filled with a specially developed non-inflammable oil.**
- **Safe and entirely reliable operation in ambient temperatures of up to 70°C.**
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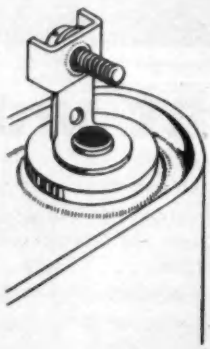
- **Seam-welded lids which form no exterior ridge, giving increased operating efficiency with reduced dimensions.**
- **If required, a screw and "U" clamp can be fitted at extra cost. (See diagram).**

★ *As streamlined as the tube itself.*



SPECIFICATION

Test Voltage:
Capacitors. Up to and including 250 volts A.C. = Wkg volts x 2
above 250 volts A.C. = Wkg volts x 2.5
D.C. Test = A.C. Wkg volts x 3
To Earth, A.C. wkg volts + 1,000 volts A.C. or 2,000 volts A.C. min
Sealing Test: Each Capacitor is heat tested at 80°C
Capacitance Tolerance: Standard limits as shown. Others by arrangement
Power Factor: Better than 0.3% at working volts at 30°C

TYPE L89/1 STANDARD RANGE

Capacitance μF	Volts A.C. wkg.	List No.	Dimensions—inches	
			Length	Cross section of all units
3.2 min	250	ZG101	2	2.148 x 1.398
4 min	250	ZG102	2½	
5 min	250	ZG103	2⅞	
6 min	250	ZG104	3	
7.4 min	250	ZG105	3½	
3.5±5%	400	ZG106	3¼	
6.8±5%	400	ZG107	5⅛	

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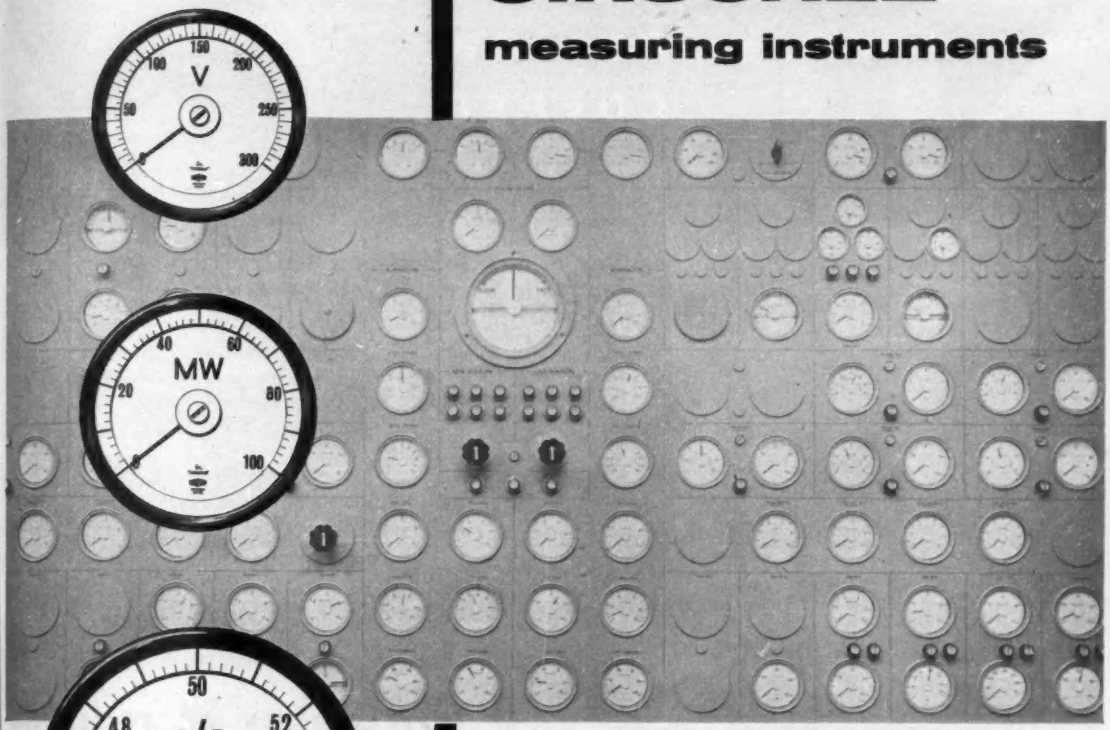
measuring instruments



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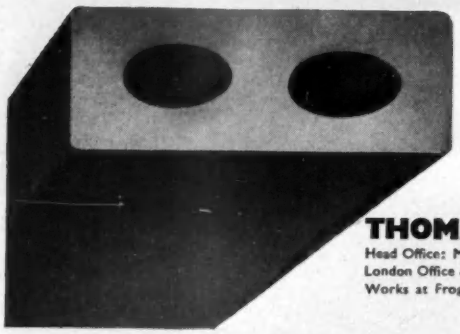
for rotor and stator windings of direct-cooled alternators and other electrical equipment. Made from H.C., "Combarloy", or other silver-bearing h.c. copper.



Your enquiries are invited, and the services of our Technical Staff are at your disposal.

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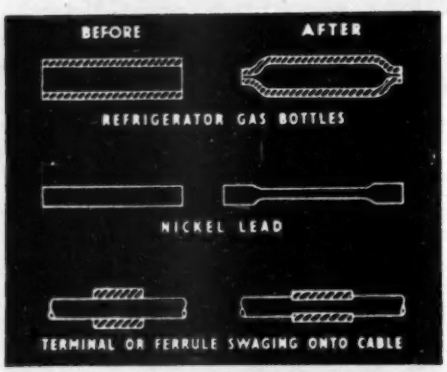
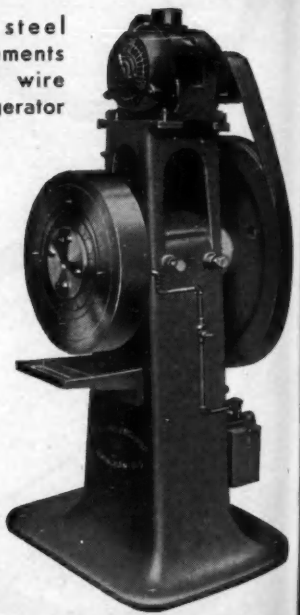
What is Rotary swaging?

It is a means of reducing or pointing tube and rod by a hammering process



Reducing powder filled steel inconnel and copper elements Tungsten and Molybdenum wire for filaments. Necking refrigerator gas bottles.



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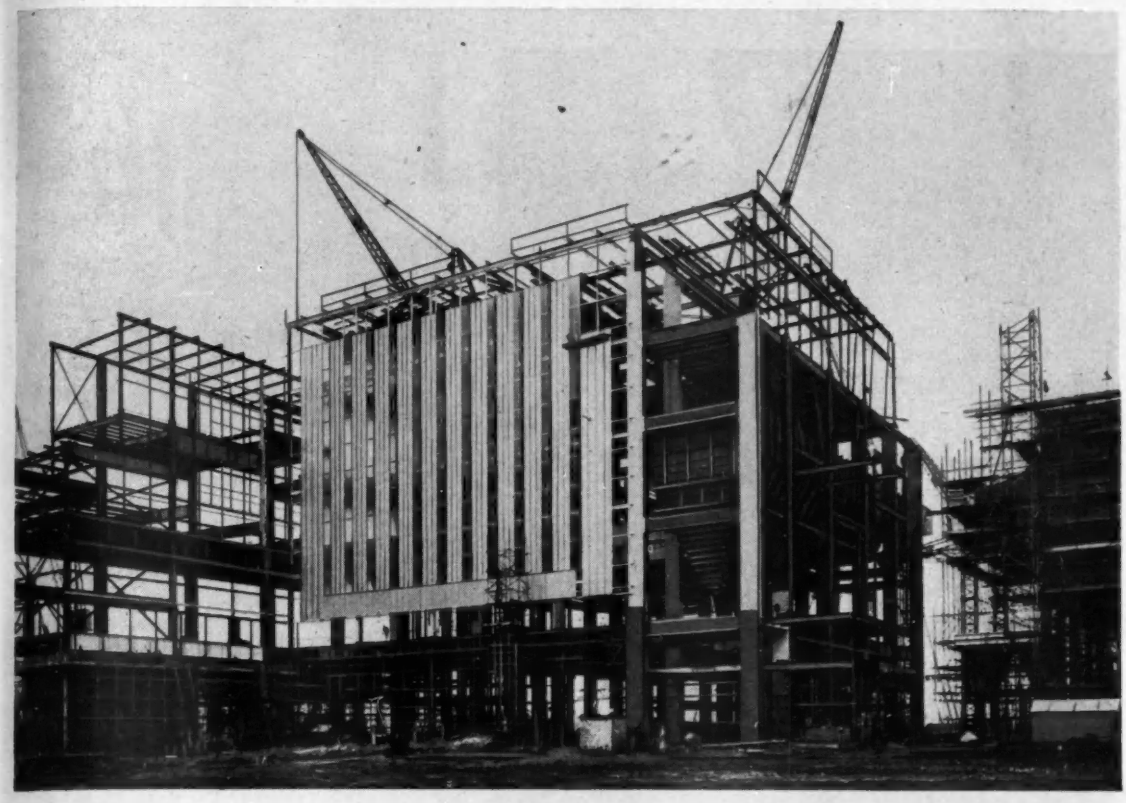

HIGH MARNHAM BOILER UNITS

work advanced on first of five 200 MW units

Construction work is now well under way at High Marnham on the first of the five reheat boiler units which IC are supplying to the CEGB. These five controlled circulation units will be pulverised fuel fired and operate under advanced conditions of temperature and pressure.

Experience of the International Combustion Limited organisation enables them to build steam generation plant to meet the requirements both of the large power station and the industrial boilerhouse.

OPERATING CONDITIONS

Steam Pressure	2,450 p.s.i.
Superheat Steam Temperature	1,060°F
Reheat Steam Temperature	1,005°F

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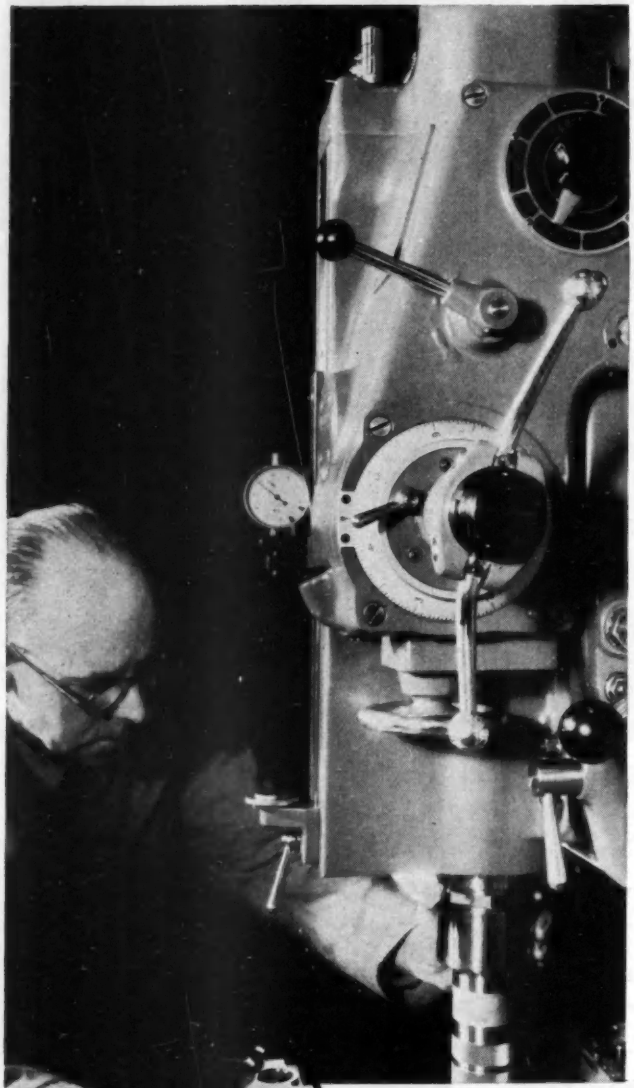

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MK

...the mark of precision

One of the new 13 amp. pilot-light switchsocket-outlets—compact, unobtrusive and easy to instal. Designed to fit the BS 1363 box, this pattern is no larger than the standard unswitched socket-outlet. Write for Leaflet 244.

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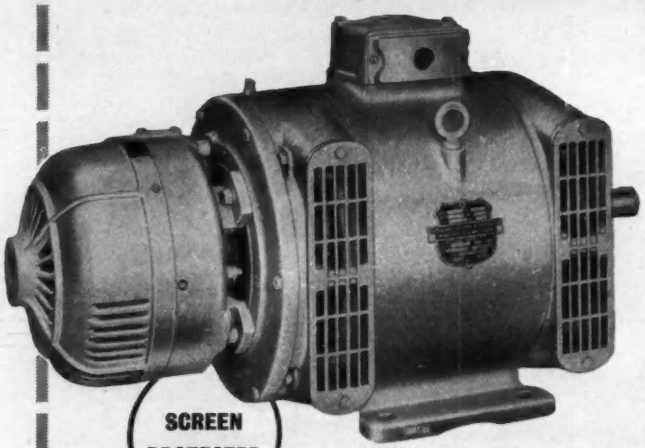
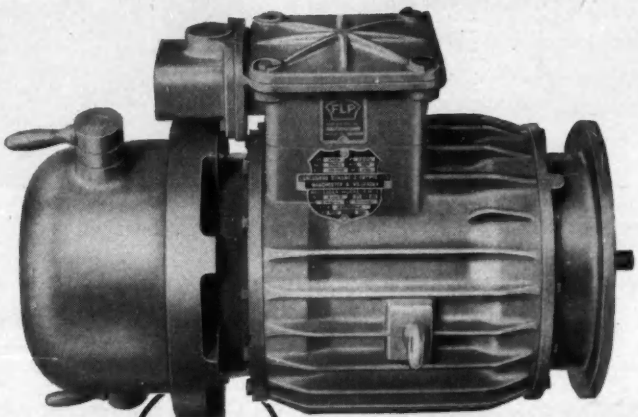
Electro-Mechanical BRAKES

incorporated with L.D.C. motors



SCREEN PROTECTED



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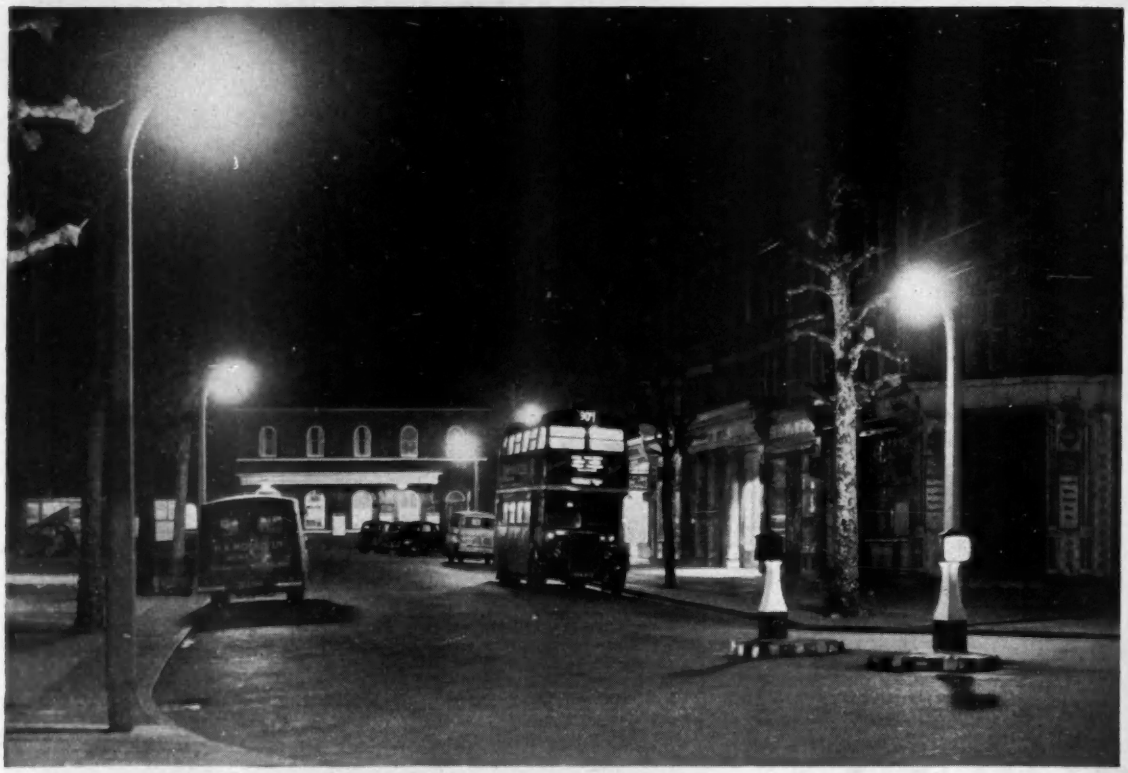
G.E.C.

Side road lighting at KEW



G.E.C. Side Road Lighting at Kew, Surrey

As part of a major scheme over 1,000 G.E.C. side road fluorescent lanterns together with Brevis Prestressed-Plus concrete columns have been supplied to the Borough of Richmond.

The lantern houses two 2 ft. 40 W. Osram fluorescent tubes and the gear necessary to operate them is supplied fitted within the lantern body.

Light control is obtained by four "Perspex" refractor plates, bonded two to each inner side of a "Perspex" bowl.

The illustration shows part of the installation at Station Parade, Kew.

Spring-actuated mechanism...
Spring-assisted manual closing...
Spring-assisted mechanism...
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IT'S STILL SAM

And Yorkshire Switchgear were pioneers in the development, perfecting and launching of S A M.
They recognised the high safety factor inherent in a controlled high-speed independent closing action and the substantial economy of this type of mechanism, and they put SAM through searching tests—up to 350 MVA at 11 kV.
Now, Yorkshire Switchgear make more SAM-type mechanisms than all their other types combined.

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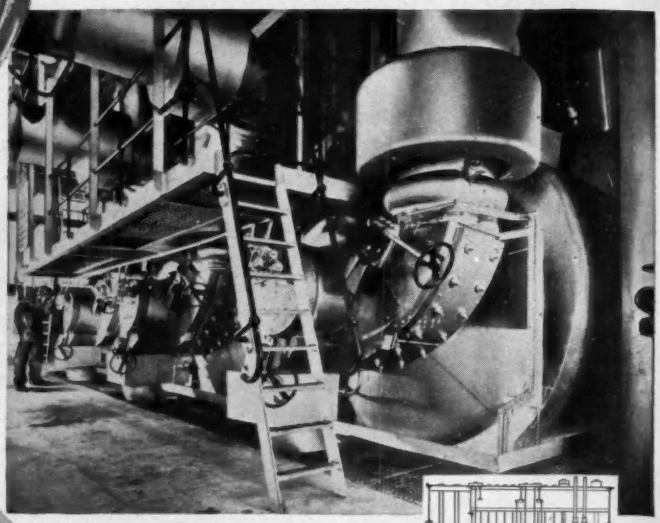
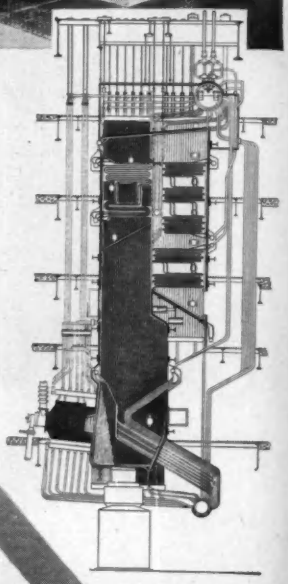
BOILER No. 44



First Cyclone-fired central-station boiler in Britain . . .

Barking, with its A, B and C stations is one of the largest single concentrations of central-station generating plant in Europe, with a total installed capacity of ¾ million kilowatts.

All 44 boilers at Barking are BABCOCK units and the latest, No. 44, is the first central-station unit operating in Great Britain with Cyclone-firing. This is a Radiant boiler with an output of 540,000 lb./hr. at 950 lb./sq. in. and 940°F, equipped with three 8-ft. diameter Cyclone Furnaces burning crushed coal, with axial entry.



Solves the ash-disposal problem

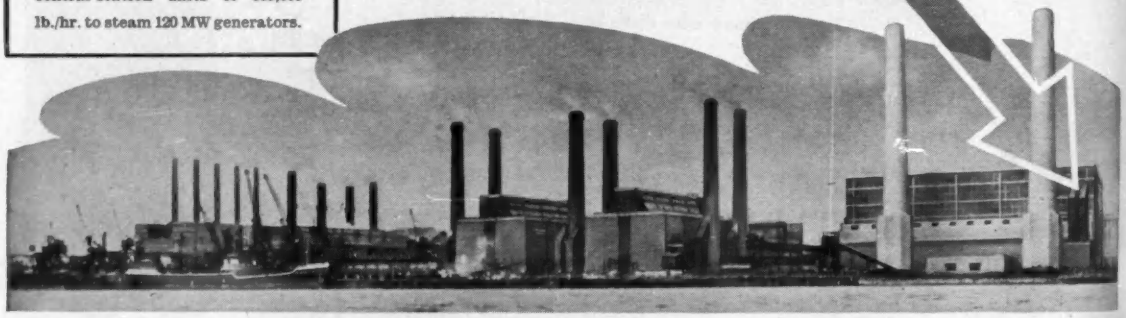
The Cyclone Furnace, by converting the ash to a granular slag that is easily handled and readily usable on civil works, provides an effective, economic solution of the ash-disposal problem.

It burns a wide range of coals with high efficiency; improves boiler-availability; is safe, flexible in operation and well-suited to simple automatic combustion control.

Over 100 BABCOCK Cyclone-fired boilers

are ordered or in service in various countries. In Britain, units in service, under construction or on order, range from large industrial boilers of 200,000 lb./hr. up to central-station units of 860,000 lb./hr. to steam 120 MW generators.

BABCOCK *Cyclone-fired* BOILERS



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25 APRIL
1958

ELECTRICAL REVIEW

Managing Editor: HUGH S. POCOCK, M.I.E.E. *General Editor:* J. H. COSENS *Technical Editor:* P. W. TUCKER, M.I.E.E.

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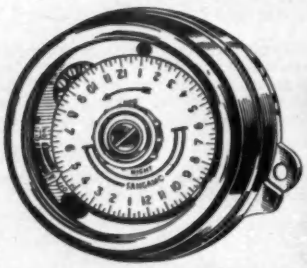

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ELECTRICAL REVIEW

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Purchase Tax

THE large reduction in the rate of purchase tax on some of the principal domestic electrical appliances is most welcome, and long overdue. The domestic equipment branch of the electrical industry—manufacturers, wholesalers and retailers—has suffered many setbacks since the war and because of the combined effects of purchase tax and credit restrictions production facilities have not of late been fully used. With refrigerators, in particular, the marked drop in prices at the beginning of the main selling season should lead to a substantial increase in home sales in coming months and the consequent expansion in production should enable manufacturers to compete more effectively abroad.

The reasoned arguments put forward by electrical trade and development associations against the continuance of the purchase tax upon domestic electrical appliances have for several years been a familiar part of the pre-Budget advice that is urged on every Chancellor. Indeed they were in danger of losing their effectiveness by being repeated so often. But this year the electrical industry was joined by others with wider interests and together they appear to have succeeded in persuading the Chancellor, at least partially, of the rightness of their case that these appliances should not be taxed as luxuries. There is also good reason to hope that the process now begun of rationalising and simplifying the whole system of purchase tax will be continued.

As we have pointed out previously, Germany's rapid progress as an exporter of domestic electrical appliances owes much to the fact that she has an unrestricted and rapidly expanding home market. Exports also form a much lower proportion of total production than in this country, and this naturally places German manufacturers in a strong position. Not only can they deal more economically with the individual requirements of overseas customers, but they can undertake improvements in design, with the consequent high tooling costs, more frequently. With the growth of competition and local manufacture such considerations become of increasing importance.

A major disadvantage of the present system of purchase tax is the disruption caused to the normal process of trade by the knowledge that large changes in the rates of tax may be made in each Budget or even in between. The immediate problem of the losses that may be suffered by retailers when the tax is reduced has to some extent been met by schemes which allow goods to be held for a period before the Budget on consignment account. A more serious effect of the uncertainty is the brake it puts on long-term planning by the manufacturers. Considerable economies can be obtained from the sustained large-scale production of domestic appliances, but such production is only possible where the demand is large and relatively predictable. This inevitably means home demand. It has been suggested that a sales or turnover tax imposed at a low rate

over a much wider range of expenditure would be less disturbing to trade than the present system of purchase tax. Both have their attractions, but the Chancellor held out little hope of a change, " at least in the foreseeable future." The problem is that purchase tax now yields nearly £500 million a year, which the Treasury is not prepared to forgo or raise in other ways. It is obvious that there would be many practical and other objections to the inclusion of goods already taxed and of services in a general sales or turnover tax. But even if they were included a uniform rate of tax approaching 20 per cent of the wholesale value would be needed, according to the Chancellor, to produce the present yield. For the electrical industry, therefore, little would be gained. On the other hand, many of the objections to purchase tax would disappear if the rates of tax on competing appliances were made equal and then stabilised at a relatively low level. But this is not an argument for lessening the struggle to get purchase tax taken off altogether.

ELECTRICITY INVESTMENT

The revised capital investment plans of the nationalised industries are detailed in a White Paper published last week, reference to which is made on page 785. As far as generation in England and Wales is concerned, the effect is to delay the nuclear power station programme by a year, while work on conventional stations planned for the next two years will take two months longer. The approved programme for 1958-59 is £127 million, £6 million more than estimated expenditure in 1957-58. Transmission takes a further £31 million and expenditure on distribution is £2 million lower at £81 million. It is reassuring to observe that somewhat more is to be spent on reinforcement (£38·2 million against £36·7 million) although, in fact, this still represents some slowing down of the urgently needed work of improving distribution systems to cope with growing demands.

In Scotland, the approved programmes of the two Boards for this year amount to £43½ million against £34 million spent last year, the increase being largely accounted for by the Hunterston nuclear station. As in England and Wales, the distribution programme of the South of Scotland Board is being somewhat curtailed. In the North, expenditure under this head is slightly more than last year.

CLEANLINESS CONTROL

Increasing need for sensitivity and reliability in electrical instruments operated with small physical forces has made it essential in many cases to eliminate even the most minute particles of dust during assembly of components. In a paper he gave to the Institution of Mechanical Engineers on planning, design and operation of " clean rooms," Mr. H. G. Harris (Elliott Bros. (London), Ltd.) mentioned as an example the common aim of removing by air filtering virtually all particles down to one micron (40 micro-inches) and in some cases to one-third of that figure.

Economic justification for the elaborate precautions he described is found in a marked reduction in rejections, a view which is supported by Mr. N. C. Rolfe (Cathodeon Crystals, Ltd., and Newmarket Transistor Co., Ltd.) in his chairman's address to the Cambridge Radio and Communications Group, as reported in the *I.E.E. Journal* for April. In discussing the design of factories for special components he refers in particular to the serious difficulties due to atmospheric contamination encountered in the manufacture of transistors during nearby building extensions. As he says, cleanliness control is the first step towards quality control, which is one of the keys to productivity.

INCREASED GENERATING EFFICIENCY

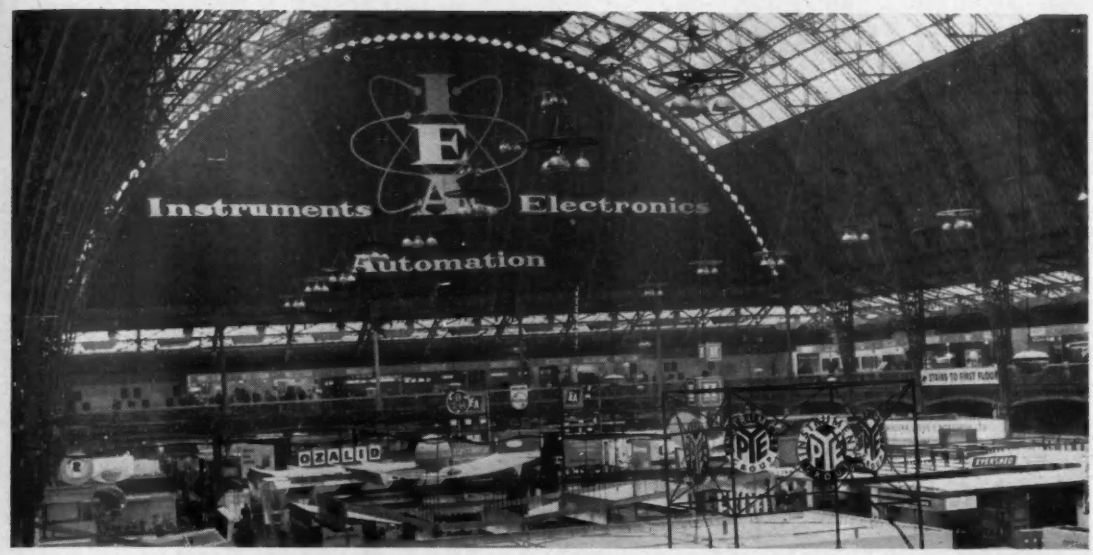
Figures which have just been issued by the Central Electricity Generating Board show that during last year nearly 1¼ million tons of coal was saved in power stations in England and Wales by increased efficiency of operation. This represents a reduction of operating cost of £5 million and would seem to nullify the argument that small increases in thermal efficiency of generation are hardly worth while in view of the fact that the cost of generation represents only a small proportion of the cost of electricity to the consumer.

During 1957 the overall average thermal efficiency was 25·38 per cent compared with 24·7 per cent for the previous year and of nearly 78,000 million kWh supplied from these stations nearly 30 per cent was provided by the twenty most efficient stations operating throughout the year. These twenty stations had an average efficiency of 29·45 per cent. At the top of the list is Castle Donington with an efficiency of 31·92 per cent. (Last year Littlebrook " B " led with 30·62 per cent.) This station has six 100 MW turbo-alternator boiler units operating with steam conditions of 1,500 p.s.i.g. and 1,050 deg F at the turbine stop valve. The efficiency figures for the other nineteen stations are given on page 800.

I.E.A. EXHIBITION

The variety of measuring and controlling devices and systems produced by the electronics and electrical instrument industries has now become so numerous that more time and effort is having to be expended by the manufacturers concerned in providing adequate technical information to prospective customers. The Instruments, Electronics and Automation Exhibition, which is reviewed in this issue, performs an essential publicity service in this connection and many potential buyers took this opportunity to see how the industry could help them in their particular fields of activity. This year's exhibition was particularly valuable in this respect since as well as single item exhibits, there were many complete working equipments illustrating the applications of electronics to a variety of industries.

Besides the standard work which electrical instrument, electronics and automatic control equipment manufacturers are doing both in the export field and at home they must be prepared to produce " tailor-made " apparatus and, provided the quality does not suffer, delivery must be as short as possible and promises must be kept. As Mr. Semmens said at the inaugural luncheon after the opening of the exhibition, the industry should not pose the question " Is the customer asking too much? " but rather " Are we doing everything we can? "



INSTRUMENTS, ELECTRONICS AND AUTOMATION

REVIEW OF THIS YEAR'S INTERNATIONAL EXHIBITION

THE second Instruments, Electronics and Automation Exhibition, held last week at Olympia in London, was for the first time international and over 100 leading manufacturers from ten countries including the United States, France, Germany, Czechoslovakia, Denmark and Sweden took part. British exhibitors totalled 250 and nearly 25 per cent were showing for the first time. The floor space occupied by this year's exhibition was one-third larger than in 1957.

The exhibition was opened on Wednesday by Sir David Eccles, President of the Board of Trade, who was heralded by eight trumpeters of the Royal Household Cavalry. He said that instruments and electronics were Britain's "glamour" industries, and he felt it was right that the exhibition should be international and that British goods were shown alongside those of other countries. The industry was now exporting a quarter of the total output, but Sir David urged that they should not be satisfied until exports rose to a third.

The opening was followed by a luncheon at which Mr. E. W. Semmens, chairman of the I.E.A. Exhibition Committee, proposed a toast to the visitors. He particularly welcomed Sir Henry Self (Electricity Council) to the exhibition. Sir David Eccles, who was to have been the guest of honour at the luncheon, was unable to attend since he was due to speak in the Budget debate that afternoon but, said Mr. Semmens, it was a great tribute to the industry that Sir David had found time to open the exhibition in the morning. As this was the first international I.E.A. exhibition, Mr. Semmens went on to welcome the overseas exhibitors and invited them to come again.

The total value of exports of the British electronic industry, the largest in Europe, was over £60 million last year, of which goods worth £3,300,000 went to dollar markets, an increase of over 100 per cent in two years. This industry more than any other needed to advertise its wares. If people in the industry itself found it difficult to keep pace with new developments, how could those outside be informed without adequate publicity? Quality of the product was the first essential, but Mr. Semmens emphasised that delivery was a more important factor in world markets than price.

In the absence of Sir David Eccles, Sir Henry Self replied on behalf of the visitors and stressed the importance of the exhibition. He wished every success to the industry which had been neglected in the 1930's and had a tremendous struggle to make up lost ground.

In the following pages we publish articles by specialists covering the three themes of the exhibition.

Sir David Eccles, President of the Board of Trade, opening the Exhibition

Modern Instrument Techniques

By H. B. WOOD, B.Sc., A.M.I.E.E.

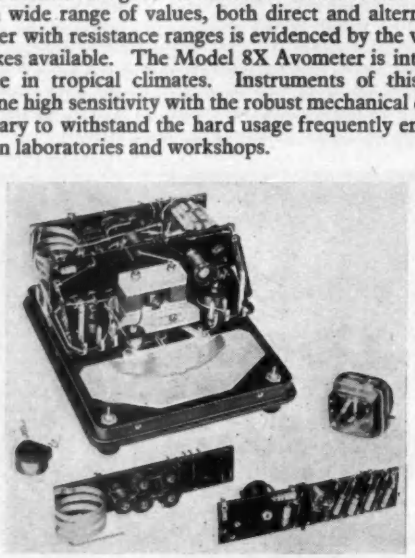
IN an exhibition which is arranged to cater for instruments, electronics and automation, the classification of some items of equipment is rather difficult, particularly as a large number of electrical instruments employ electronic circuits.

In order, therefore, to restrict the scope of this article, an instrument will be defined as any device employing either an electric or electronic circuit, which is capable of indicating the magnitude of a physical quantity by deflecting the pointer of an instrument, the electron beam of a cathode-ray tube, etc. Thus, those instruments which are entirely mechanical or optical in operation are not considered here. On the other hand, some components and techniques which are of value in the design and construction of electrical or electronic instruments are considered relevant.

The range of any given type of instrument offered by various manufacturers is, of course, quite extensive and a considerable amount of duplication frequently occurs. The particular examples of instruments cited below have been selected, therefore, merely because they are representative of a particular design, and no comparison between the products of individual manufacturers is either implied or intended.

Indicating and Recording Instruments

The instruments most commonly used by the electrical engineer are, of course, drawn from the wide range of indicating instruments such as voltmeters, ammeters, wattmeters, etc., supplemented when necessary by electronic circuits in order to extend the useful frequency range or to reduce loading effects upon the circuit under test. As a result, a tremendous variety of portable, panel mounting and switchboard instruments are available in many different shapes and sizes. The ever-increasing popularity of test meters designed to measure current and voltage over a wide range of values, both direct and alternating, together with resistance ranges is evidenced by the variety of makes available. The Model 8X Avometer is intended for use in tropical climates. Instruments of this type combine high sensitivity with the robust mechanical design necessary to withstand the hard usage frequently encountered in laboratories and workshops.



Internal construction of Model 8X Avometer

The useful range of valve-voltmeters has been extended to higher frequencies both for the amplifier-rectifier and rectifier-amplifier types. As an example of the former, British Physical Laboratories produce a video frequency valve-voltmeter having a most sensitive range requiring an input of 2 mV for full-scale deflection and an accuracy better than 10 per cent within the frequency range 40 c/s-10 Mc/s.

Resistance measurements from milliohms to millions of megohms may be made using direct reading deflectional methods by means of negative feedback amplifier circuits. The increasing demand for rigid production control and long-term laboratory measurements has resulted in the production of a considerable variety of recording instruments. In order to obtain a short time constant or response time without overshoot, most of the recorders currently available employ some form of servo system to drive the pen. The general arrangement involves the use of a potentiometer or slide wire circuit, the moving contact of which is mechanically coupled to the recording pen and so arranged that a reference potential derived from the potentiometer is compared with the input signal which is to be recorded. The difference between the signal and reference voltages, i.e. the " error " voltage, is amplified and the amplified output used to operate a motor which drives the pen and sliding contact of the potentiometer in the appropriate direction so as to reduce the error voltage.

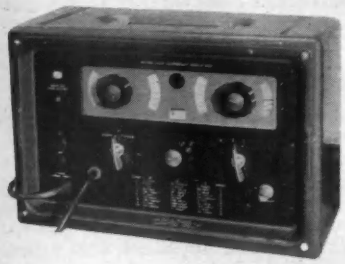
Small d.c. potentials may be accurately recorded without the stability difficulties normally encountered in d.c. amplifiers, because the error voltage may be converted to a.c. by means of a chopping circuit and the chopped d.c. output amplified in a normal a.c. coupled amplifier.

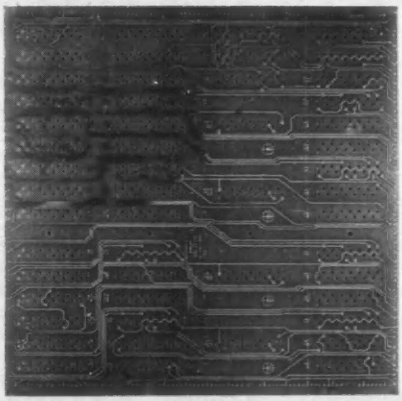
An incidental advantage of the servo-operated recorder over the conventional moving coil type of instrument is that the chart may have a rectangular co-ordinate system as the motion of the pen is rectilinear instead of along an arc of a circle. The use of a rectangular co-ordinate system allows the analysis of the recording to be performed rather more easily.

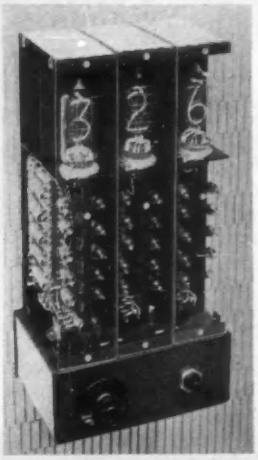
Bridge Networks

A type of bridge circuit which has become very popular during the past few years is that in which the conventional ratio arms are replaced by transformer windings, the " ratio " of the arms being determined by the turns ratio of the transformer windings, an arrangement which permits an initial adjustment of extremely high accuracy to be achieved.

The major advantage of this type of circuit over the more usual networks is due to the fact that when the bridge is balanced, the ampere-turns associated with one winding of the ratio arms are exactly balanced by those associated with the other. Thus, the balance condition is characterised by zero magnetic flux in the core of the transformer, and consequently the effective impedance of the ratio arms under these conditions is simply the d.c. resistance and leakage reactance of the windings. This means that three of the four corners of the bridge network are at essentially the same potential, and therefore unwanted impedances may be placed across a ratio arm with but little effect upon the bridge balance. This effect is particularly useful at high frequencies where the produc-







Above: Wayne-Kerr universal impedance bridge

Centre: Technograph printed circuit

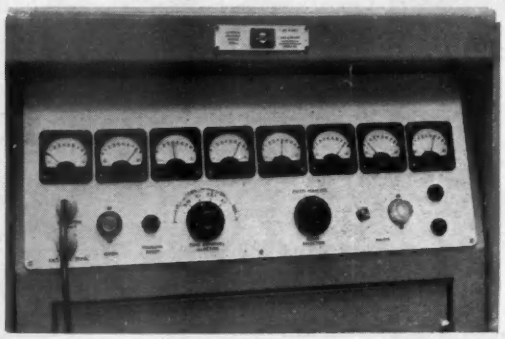
Right: Ericsson "Digitron" register tubes

tion of ratio arms of reasonable accuracy is not easy, and also in circuits where guard rings are normally required, e.g. in the measurement of the direct impedance between terminals A and B of a three-terminal network, and impedances exist between both terminals A and B and a third terminal C. A common example of this type of situation occurs in the measurement of a component without removing it from the circuit into which it is wired. This instrument is a universal impedance bridge, employing transformer ratio arms, and designed for the measurement of inductance, capacitance and resistance over a range of approximately 1 : 10^{12} in each case. The circuit, which operates at 50 c/s and has a self-contained detector, indicates the magnitude of the resistive and reactive components of the impedance under test in terms of a parallel combination of resistance and capacitance or resistance and inductance.

The bridge illustrated is one of a series of such circuits produced by Wayne-Kerr Laboratories for the measurement of impedance by null methods up to 250 Mc/s. Above this frequency the difficulties of defining a lumped impedance become considerable.

Printed Circuits and Components

Printed circuits and components are featured in the products of about a dozen manufacturers, and an idea of the complexity of the circuit arrangements which can be produced may be obtained from the accompanying illustration. The board, which is produced by Technograph Electronic Products, is printed on both sides, thus permitting a more compact construction than could otherwise be obtained. Although most of the printed circuits comprise "wiring" only, conventional components being soldered to the board, some components such as switch plates and commutators are produced.



Cintel automatic frequency monitor

Resistors and low-value inductors and capacitors can be printed directly into a circuit, the limit being set by the area available.

From the point of view of instrument design, the use of printed circuits offers the advantages of mechanical rigidity and reproducibility in addition to the obvious virtues of economy and the avoidance of wiring errors. Several instruments employing transistors are now available, although in the case of some reasonably large mains-operated instruments the advantage of using transistors instead of valves is not obvious.

Counting Devices

A wide variety of counting circuits are now obtainable employing either gas tubes or hard valves, depending upon the desired maximum counting rate.

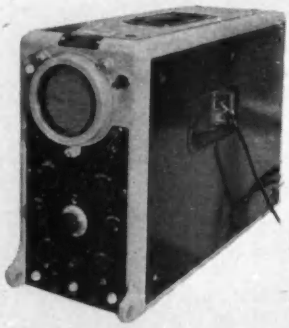
In general, multi-cathode tubes such as the Dekatron are suitable for maximum counting rates of 20,000 per sec and above this hard valve circuits must be used.

A novel display tube has been introduced by Ericsson Telephones. The tube, which is called the "Digitron," provides a numerical display of the digits 0 to 9 in characters 1¼in high by ¾in wide. The characters, which are formed from wire and arranged one behind the other from the front to the back of the envelope, comprise the cathodes of a neon tube. When a negative pulse of sufficient amplitude is applied to a particular cathode, the valve strikes and the cathode glow illuminates the particular digit concerned. The large size of the characters allows the tube to be read from a distance of about 40ft.

A feature of the tube is that if the counting rate of the counting circuit is too high, the display tube will simply extinguish, but when the counting rate falls, the display will be correct. This is because the tube is purely an indicating device and must be driven by a counting circuit.

Hard valve counting circuits are, of course, capable of operating at a very much higher rate than those employing gas tubes, although the circuitry associated with the former is more complex.

A good example of the use of a hard valve counting circuit is provided by the Cintel Automatic Frequency Monitor, in which the number of cycles executed by the input signal is counted over a period of 1 sec, and the result presented in decimal form by the positions of



Cossor millimicrosecond pulse test set

the pointers of the eight meters located on the front panel of the instrument. The accuracy of this type of instrument depends upon the accuracy with which the 1-sec period is measured. This period is determined by means of a crystal-controlled oscillator, and, consequently, an overall accuracy of one part in a million is obtainable.

Oscilloscopes and Associated Circuits

Progress in the design of oscilloscopes is to a large extent due to improvements in the vertical amplifiers, both in terms of frequency response, stability and freedom from distortion. Thus, the E.M.I. oscilloscope has a sensitivity of 0·1 V/cm deflection from d.c. up to 12 Mc/s when used in conjunction with a special plug-in amplifier, and the instrument permits the measurement of voltage and time to accuracies of 3 and 2 per cent respectively. Errors due to screen curvature are minimised by the use of flat-faced c.r. tubes, and post-deflection acceleration is now standard in most designs. Beam switching units are incorporated in a number of oscilloscopes thus allowing several phenomena to be viewed simultaneously. Multi-gun tubes are also available for this purpose.

A specialised oscilloscope for viewing the very short pulses now used in testing wide band equipment was shown by A. C. Cossor, Ltd. It incorporates a pulse generator designed to produce a short output pulse (2-30 millimicrosec duration) which is applied both to the input terminals of the network under test and also to the trigger of the display unit time base via an adjustable delay circuit. The pulse appearing at the output of the network under test may be viewed on the c.r. tube, and the delay time and distortion of this pulse relative to that applied to the network is a measure of the delay time and the amplitude and phase responses of the network. Although the sweep speed of the time base is quite high, the sweep recurrence rate of 2,000 per sec ensures that the trace may be viewed without difficulty.

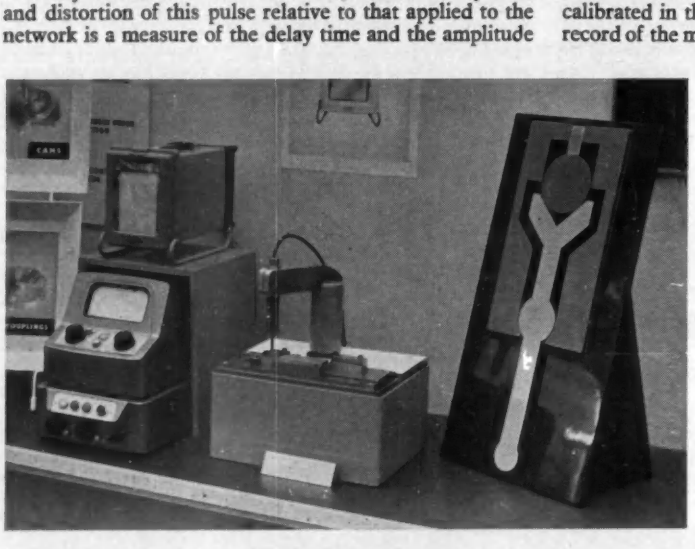
Constant Voltage Transformer

Most electronic instruments require constant supply potentials to ensure successful operation, and it is, therefore, quite common to supply h.t. power to the electronic measuring circuit via a neon or hard valve stabilising circuit in order to reduce the effects of mains supply fluctuations.

The stabilisation of valve heater supplies is a little more difficult on account of the relatively heavy current required at low voltage, but the use of devices such as the barretter, etc., provides a reasonable degree of stabilisation. In some cases, it is rather more convenient to operate the instrument from the output of an a.c. stabilising circuit, but difficulties may still be encountered if the a.c. stabiliser produces a significant amount of waveform distortion. A rather neat solution is provided by the plate and filament constant voltage transformer manufactured by Advance Components. This component allows heater and rectified d.c. plate voltages to be obtained which are constant to within 3 per cent for input changes up to 15 per cent. It is, however, necessary to operate the unit from a substantially constant supply frequency as the output voltage is frequency sensitive.

A three-dimensional tape-controlled inspection system shown by the Inspectorate of Electrical and Mechanical Equipment of the Ministry of Supply provides an elegant example of the application of both electronics and optics to the production of an instrument for the accurate measurement of position in three dimensions.

Briefly, the position of the measuring head of the instrument is specified in terms of the co-ordinates of the point relative to an arbitrarily-fixed origin, and the measurement of length along each axis is performed by observation of the interference pattern formed by the super-position of two diffraction gratings when slightly inclined relative to each other. The machine is programmed by means of a magnetic tape, so that the positional errors which occur when the measuring head follows the contours of a surface may be directly indicated by means of an ink recorder. Zero error corresponds to a line drawn down the centre of the chart which is calibrated in thousandths of an inch. Thus a permanent record of the measurements is automatically obtained.



Above: Advance Components plate and filament constant voltage transformer

Left: M.O.S. three dimensional tape controlled inspection system

Electronic Equipment Design Trends

By G. M. ETTINGER, M.Sc.*

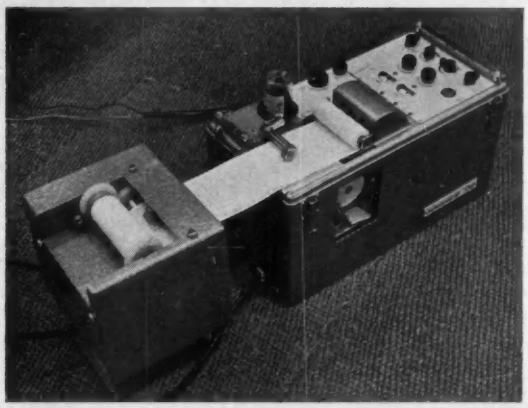
THE equipment on view at this year's I.E.A. exhibition ranged from complete electronic control, data handling and computer systems to individual measuring and recording instruments, valves, semi-conductor devices and electronic components. A number of stands, representing both British and overseas manufacturers, showed comprehensive ranges of laboratory instruments such as valve voltmeters, oscilloscopes and oscillators. Radiation measuring equipment was shown on nineteen stands and a wide range of analogue computers and computer elements were on display.

Amongst exhibits of electronic computers, medium-size analogue machines consisting of, say, from 10 to 20 plug-in units, were widely represented. A useful instrument for the presentation of analogue computer output is, of course, the X-Y plotter of which an example was the "Speedomax" Model S which is manufactured by Integra, Leeds & Northrup, Ltd. Full-scale ranges of 100 μV on the X-axis and 1 mV on the Y-axis are obtainable in the instrument, which employs self-balancing systems in both axes, with pen travel time of 1 sec (X-axis) and chart travel time of 4 sec nominal (Y-axis), records being obtained on 10in by 10in charts. Other types of recorders included the Elema Schoenander direct writing jet recorder oscillograph shown by Sierex, Ltd. Recordings can be made up to 1,000 c/s and up to four channels are available.

A number of cathode-ray oscillographs were on display, ranging from lightweight miniature units such as the Telequipment direct-coupled Serviscope to wide-band oscilloscopes and to demonstration oscilloscopes. One example of these was the Marconi Instruments type TF 1159, employing a 17in rectangular magnetic deflection cathode-ray tube with white trace. This instrument has a sensitivity of 4 mV/cm, and was shown tracing the response curve of a filter connected to a TF 1099 sweep generator.

Industrial applications of electronic analogue measurements were represented, for example, by the Crosfield "Autotron" automatic length and side register control for colour printing presses with an accuracy of control of $\pm$0·003in, subject to good condition of the press mechanism. Error signals for this equipment are obtained from a scanning head with a light source and two photocells monitoring light from two lines printed on the web in the previous colour. Displacement of the web varies the time interval between signals from the photocells; this interval is converted into direct current for actuation of a servo-motor. On the stand of F. C. Robinson & Partners, Ltd., the E.R.A. dispersion meter model 2A was shown. This instrument determines dielectric dispersion and leakage time constant for electric insulating materials by a pulse method. Direct readings up to 0·4 dispersion are obtained. The Mine Safety Appliances Co., Ltd., showed the sensitive L.I.R.A. "infra-red gas analyser."

The range of digital apparatus shown was very wide. A demonstration by Elliott Brothers, for example, represented instrumentation for an oil-fired boiler with a computer for calculation of boiler efficiency. Southern Instruments, Ltd., showed the "Sindak" trace reading equipment which can be used with strip records up to a width of 6in. Information from the strips, typically film or paper, may be converted into electrical analogue or digital signals by movement of a cursor driving a potentiometer. An important component of digital systems is the counter or scaler, of which a considerable variety were shown by a number of exhibitors. Such instruments, as well as digital voltmeters, frequently employ numerical decimal readout of two general types: Hilger & Watts in-line indicators, or numerical register tubes such as the Ericsson type GR 10 G. An application of digital voltmeter techniques to the setting-up of an analogue computer was shown by Solartron. A new Marconi industrial television camera, type BD 871, was shown monitoring the reading of a high-speed (20 counts per sec) electromechanical register by Counting Instruments, Ltd. A six-decade counter/timer, type TF 922, operating directly to 1 Mc/s, was shown by Marconi Instruments, Ltd. The timing oscillator of this instrument is crystal controlled to one part in 10^5.



Sierex jet recorder

E.R.A. model 2A dispersion meter

A number of transistorised instruments, especially counters, were seen. These included counters by Venner and by Cinema Television, Ltd., and a computing counter controller by Racal. Transistors were in evidence also in

* Marconi Instruments, Ltd.

1. *Mullard nuclear magnetic resonance spectrometer*
2. *Crosfield "Autotron"*
3. *"Sindak" K1028 trace reading equipment*
4. *Baldwin backscatter gauge*

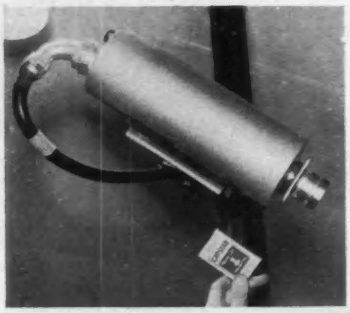
low-voltage regulated power packs, such as the Langham Thompson LTE 12·5/0·75 and a Marconi dual-regulated supply with an output resistance of less than 0·01 ohm and built-in attenuator to produce regulated signal inputs to amplifiers.

Industrial applications of radio-isotopes and X-rays were shown on a number of stands. For the measurement of coating thickness, the Baldwin Instrument Co. showed a beta-ray backscatter gauge with automatic standardising facilities. This instrument measures the weight per unit area of coatings such as lacquer on metal. Detection of back-scattered radiation is achieved by means of ionisation chambers. Isotope Developments, Ltd., demonstrated simple radiation detectors termed "Gamma-switches" for applications such as flow failure warning. Ekco Electronics, Ltd., showed a gamma-ray backscatter gauge and a Bremsstrahlung (low-energy X-ray) measuring head. A fluoroscopic radiographic unit, type TF1601, for industrial inspection was shown by Marconi Instruments, Ltd. Operating on a different principle to that of isotope gauges was the Nash & Thompson BNF coating thickness meter which is used, for example, to determine the thickness of nickel plating on steel or non-ferrous alloys. The quantity measured by this instrument is the thermo-electric voltage generated between the two metals when a temperature gradient is established across them.

A proton resonance spectrometer for chemical analysis was shown on the stand of Mullard, Ltd. This may be employed in the precise analysis of resonance spectra such as that of ethyl-alcohol. Constant frequency is employed, together with a magnetic field made up of permanent magnets and magnetising windings for fine adjustment and sweep. The spectrometer employs magnetic fields stated to be accurate to one part in 10^7.

Amongst new electronic developments there is a carrier amplifier by Electro Mechanisms, Ltd. In this unit, voltage step-up is achieved by means of transformers, valves being employed only as coupling elements, impedance transducers or current amplifiers. The carrier amplifier is designed to work with strain gauges or variable inductance acceleration pick-ups.

Semi-conductor devices on view included Zener reference diodes in the range 5 to 9 V and sub-miniature hearing aid transistors (types OC65, OC66) by Mullard, Ltd., and solar cells and silicon diodes and transistors by Hoffman Electronics on the Livingston Laboratories, Ltd., stand. Semiconductors, Ltd., showed micro-alloy diffused transistors for operation at some hundreds of megacycles, and a new intermediate power germanium transistor was shown by the Newmarket Transistor Co.



Left: LIRA infra-red gas analyser cubicle, model 100

Centre: Marconi fluoroscopic and radiographic unit

Above: Marconi type BD871 "Vidicon" industrial television camera

The General Electric Co., Ltd., showed a transistorised invertor for operation of fluorescent tubes from low-voltage batteries.

An interesting development in lightweight instrumentation is the S.F.I.M. miniature continuous-trace recorder, type A 13, having a capacity of up to 17 channels on 90 mm photographic paper. A Polaroid oscillograph camera, with facilities for obtaining a processed record one minute after exposure, was shown on the Langham Thompson, Ltd., stand.

Amongst electronic power applications there may be mentioned a Kerry 2 kW ultrasonic cleaning bath, a 1 kW variable-frequency generator by Microcell Electronics, and an 18 kW high-frequency induction heater by the General Electric Co., Ltd.

In this, as in most electrical exhibitions, servo components played a significant part. A range of magslip components was shown by Muirhead, Ltd., servo-motors and tachogenerators were displayed by a number of manufacturers and a range of multi-card servo-potentiometer units, as used in flight simulators, was shown by Air Trainers, Ltd.

A number of impedance bridges were shown, including the Klempt automatic sorter for resistance and capacitance on the stand of Livingston Laboratories, Ltd.; a wide range universal impedance bridge with means for bridge voltage indication (type TF 868) on the Marconi Instruments stand; and the Wayne Kerr component bridge, type B 521, which employs inductive ratio arms.

Amongst overseas exhibits may be noted a stand organised by C.O.M.E.F. (the French measuring instrument manufacturers' association for export promotion) on which were shown the products of twelve French manufacturers. These products included test meters, panel meters, laboratory instruments, such as the "Ferisol" type HA 101 automatic frequency meter, multi-channel pulse height analysers by Intertechnique, ratemeters and monitors by Nardeux, and a pen recorder by SEFRAM. This recorder is available with up to five moving pen motors operating to 100 c/s. Instrument manufacturers from a number of Continental countries and the United States showed ranges of laboratory equipment.

To sum up, the following trends appeared in the exhibition as a whole: reduction of size of some standard electronic instruments and recorders, both of the panel mounting and portable types; direct visual presentation of output from voltmeters and counters; increasing industrial applications of radio-isotopes; the emergence of transistors to a limited extent, primarily in the field of nucleonic instrumentation.

E.R.A. REPORTS

Side Blast Baffle Switch.—The Electrical Research Association has recently published a report, Ref. G/XT85, on "Performance and Post Arc Resistance of E.R.A. Side Blast Baffle Circuit-Breaker in Heavy Current Tests," by W. B. Whitney and L. Gosland (price 21s). This report gives particulars of the tests, the results of which indicate that, with available design data, uniform operation of a baffle switch over a wide range of currents is attainable, which should make possible a reduction in depth of baffle pot as compared with other designs less uniform in operation. At the upper end of the current range the tests were mainly made to examine the suitability of a baffle switch for use as a β-switch in the study of restriking voltage transients for power supply networks, and the results of these tests show that such a switch is suitable over a wide range of working conditions. Certain limitations are discussed and methods of minimising them are suggested.

Cold Cathode Arcs.—In report Ref. L/T330, "The Concentration of Current at Arc Cathodes," by A. E. Robson (price 7s 6d), there is a discussion of all cold-cathode arcs, that is to say, arcs whose cathode materials have boiling points far below the temperatures at which thermionic emission could occur. The mercury arc is characterised by a small bright spot at the cathode which is constantly in random motion over the cathode surface. This "spot" is actually a luminous region of dense excited and ionised vapour immediately above the current-carrying area of the cathode. On account of its small size and random motion, only a few measurements have been made on the properties of the spot, and these, together with the Association's own observations, have enabled a picture to be constructed of conditions in the spot region, and an outline of this picture is given in the report.

Tungsten Trioxide.—An assessment, in terms of the Maxwell-Wagner model of a non-uniform dielectric, of the electrical properties of tungsten trioxide ceramic capacitors and the dependence of their properties on temperature and chemical treatment, is given in report Ref. L/T326, "The Electrical Properties of Tungsten Trioxide (Interim Report)," by J. Hirsch (price 24s). On the basis of the results obtained, some conclusions are drawn concerning the use of the material as a high-permittivity dielectric.

Automatic Devices and Control

By G. P. L. WILLIAMS, B.Sc.*

IN the automatic control field, the most noticeable trend shown by the displays at this year's exhibition is the preoccupation with complex systems of control. The development of control instruments shows steady progress but it is overshadowed by the strides which have been made in the interconnection of a variety of simple control elements to form elaborate systems. In parallel with this development, a number of new techniques have been devised for using the simple two-position and proportional control actions.

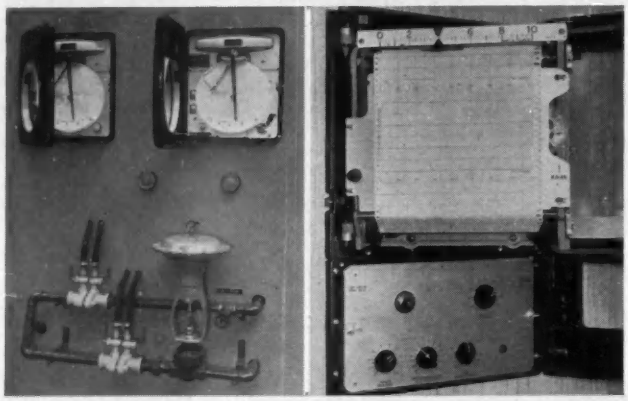
Automatic Control Instruments

A new design of pneumatic proportional controller was shown by Foxboro-Yoxall, Ltd., in which the mechanism was reduced to its simplest terms. The error signal movement was detected by a nozzle and flapper in the conventional way, the pressure in the nozzle varying in accordance with the proximity of the flapper to the nozzle outlet, and feedback to the flapper was applied by means of a second nozzle mounted in a fixed position so that the nozzle-air reacted on the flapper. The first nozzle was movable, parallel to the flapper, and provided the means of adjusting the proportional band of the controller by altering the distance, along the flapper from its pivot, at which the nozzle was operative. A variation of proportional band from 25 per cent down to ½ per cent was obtainable; at the lowest setting the controller became, in effect, a two-position or "on-off" control.

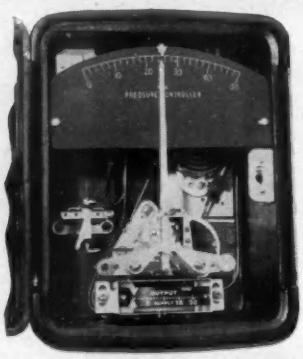
Three-term air-operated controllers were displayed on a number of stands. George Kent, Ltd., showed the Mark 30 range of control equipment which has been developed from the Mark 20 series to give greater flexibility and stability of control. The improved performance was partly due to the introduction of a stabilising feedback element which made error signal changes have a partial effect in the proportional bellows chamber instantaneously, thus reducing the chances of instability due to time lags in the air relay and derivative restrictor. This exhibit also indicated how components of the Mark 30 series can be combined to perform computing functions, as illustrated by a mass flow measuring system in which pressure and temperature correction was applied to a flowmeter, the computation being carried out by standard control system components.

In the Negretti & Zambra, Ltd., pneumatic controller, which was shown in one-, two- and three-term versions, the main distinguishing feature was the generation of each control term independently, in separate plug-in units. In the three-term version, the integral, derivative and proportional actions did not interact, facilitating setting operations.

Another pneumatic controller, making its first appearance in this country, was the Taylor Controls, Ltd., "Transcope." This is designed to mount on the rear of graphic panel instruments and is a four bellows unit with proportional, derivative, integral and feedback pressures each applied to a bellows moving a rocking plate to which a nozzle and flapper error detector is connected.



Left: Kent "Commander" instruments with Mark 30 control connected in a ratio control system. Right: The compact "Type H Speedomax" controller shown by Integra, Leeds & Northrup, Ltd.



Foxboro-Yoxall narrow band controller

On the Integra, Leeds & Northrup, Ltd., stand, the controlling units were not new, but the method of combining them with the Type H compact electronic potentiometer, was new. The controlling units would now be supplied as an integral part of the measuring instruments and combinations of round- or strip-chart recorders were available with air operated or several forms of electric control.

Three-term electronic controllers were shown which were capable of performing almost any operation that could be done by their older-established pneumatic counterparts. The Evershed & Vignoles, Ltd., unit, for example, could be set for proportional band from 5 per cent to 325 per cent in two ranges, integral action time from three seconds to 30 minutes and derivative action time up to three minutes.

Bailey Meters & Controls, Ltd., have also developed a three-term electronic controller, transistor operated, with action times up to 30 minutes and also an electronic multiplier for use in control systems with computation. The main display on this stand showed the well-established pneumatic controllers, but it was anticipated that electronic control with hydraulic operation of regulating

* George Kent, Ltd.

units would take the place of air operation in the future. It was noted that there was a good case for standardisation of electric control and transmission signal range, in line with the 3-15 lb/sq in universally used in pneumatic control. The Bailey controller uses a 0-10 mA range, the Evershed controller 0-15 mA and other ranges are in use by other companies.

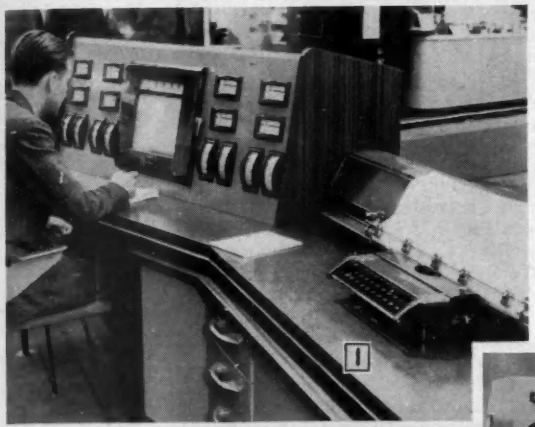
Process Control Applications

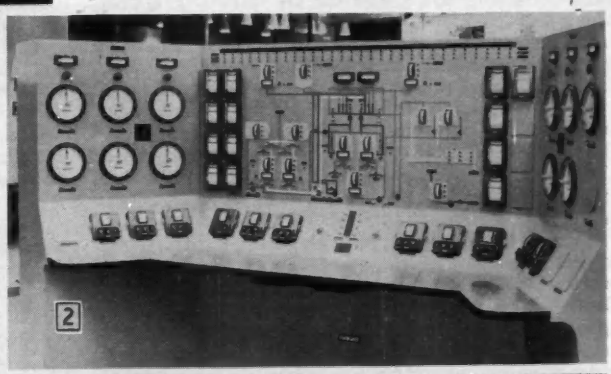
One of the major difficulties facing the designer of an automatic control system is the lack of knowledge of the characteristics of the process plant to be controlled. Without knowing the transfer function of each unit of the plant it is not easy to predict where proportional action will be adequate and where three-term action is essential for over-all plant stability. This problem has, in recent years, been tackled by making an analogue to simulate plant characteristics and carrying out tests on the analogue, often with a speed-up of the time scale, to determine the required transfer functions.

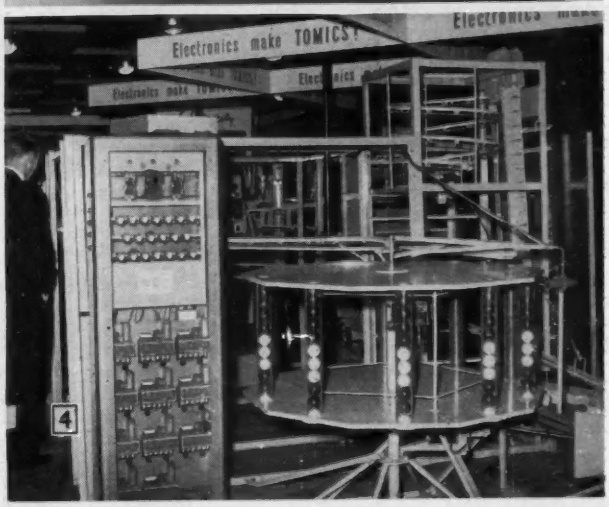
An example of this approach was displayed by E.M.I., Ltd., who showed an electrical analogue built to simulate a chemical process plant. By its use the design of the control system for the plant had been considerably eased and much pilot-plant work had been eliminated. This analogue had led to the design of more versatile analogue computers, which were also displayed. These were built up on a modular basis, various standard computing units being interchangeable, so that any required combination could be made to simulate a particular plant.

Another way in which computer techniques aid control was shown on the Elliott-Automation, Ltd., stand where there was the computer desk for a large control system built to control a gas-from-oil plant operated by the South Eastern Gas Board. The control system itself was composed of a number of electronic and pneumatic process controllers operating on the air, steam, oil and gas flows in the plant. Transmitting instruments measuring the flows, pressures and temperature sent signals to the computer desk where a data handling system recorded the values received from the various units of the plant, in tabular form. At the same time the efficiency of operation was automatically computed and tabulated, in terms of therms of gas per unit volume of oil, enabling the operator to form an accurate assessment of the setting of the automatic controllers to optimum conditions.

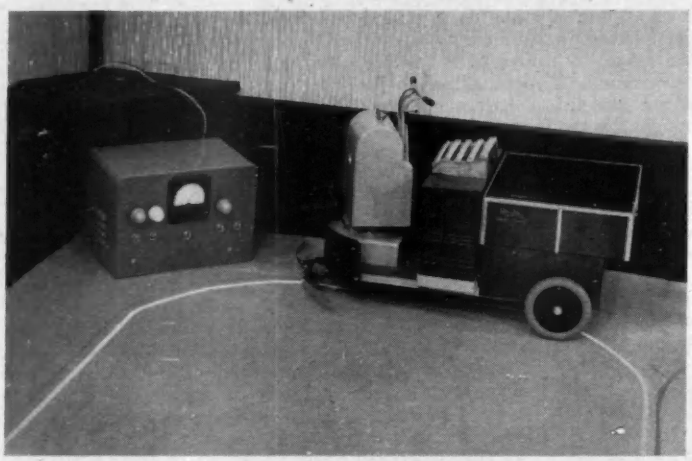
In less complex systems, some interesting techniques







1. The computer desk of the SEGAS efficiency computer by Elliott-Automation. 2. An Evershed & Vignoles graphic panel for chemical plant control using a number of 3-term electronic controllers. 3. The Ekco N604 automatic control applied to calendered material. 4. The production of "Tomics" by the Electrical Development Association



A model of the driverless truck designed by E.M.I., Ltd.

for applying control to specific processes were to be seen. An Ekco, Ltd., exhibit showed the application of density control to calendered material. The density of the sheet was measured by a β-ray gauge and was used to control the roll pressure. A simple proportional control would be unstable in this application because of the distance-velocity time lag between the rolls and the measuring point. The difficulty was overcome by operating the controller on a timed sequence. For the first period of a cycle, which lasted for at least the time of the distance-velocity lag, the measuring instrument was in operation; the second period was occupied by the control action being applied, this action being proportional to the mean error integrated over the previous measuring period; for a third period the system was inoperative. This cycle was repeated continuously and the adjustment of the length of each period of the cycle was either pre-set manually, or could be automatically set in relation to roll speed by a tachogenerator on the roll shaft.

A demonstration by Kelvin & Hughes, Ltd., of oil burner control included a novel way of solving the well-known problem of obtaining accurate electrical regulation. A simple electrical proportional controller was used, and a cyclic motion was applied to its desired-value setting pointer to move it continuously over a small part of the scale equal to the proportional band. The controller therefore produced an output which was pulsed, the mean value of the pulse signal being proportional to deviation. In the regulation this pulse signal was applied to heat a bimetal strip which operated a mercury switch. When the switch closed it started a motor and the rotation of the motor shaft tilted the switch back to break the circuit. Thus the motor shaft rotation, which was used to regulate the oil burner, was always proportional to the deflection of the bimetal strip and hence to the control signal.

Automatic Production and Materials Handling

Automatic control systems provided scope for some of the most entertaining exhibits in the show, which illustrated the spectacular results that can be obtained with simple controllers when these are organised on a systematic basis.

The production of "Tomics" displayed by the Electrical Development Association attracted many visitors with its network of conveyors, automatic weighers and sorters operating on a fast-moving assortment of coloured balls. The object was to demonstrate how production processes may be automatically controlled and co-ordinated and this was done by producing the fictitious "Tomics" which were assembled from selected components (coloured balls) in a predetermined order. The electronic controller, which was the nerve-centre of the system, not only set in motion the various production processes, such as batch counting and weight checking, in the correct sequence but also kept a steady flow of production by holding back one process until another was completed.

A further illustration of the possibilities of automatic control of batch production was to be seen on the Mullard, Ltd., stand, where a sequence controller was used to show how logic control circuits can be used. The logic units, transistor operated, were built up in sheet form using printed circuits and could be combined to give the desired sequence of operations. The individual sheets of circuits were hinged together, in a cabinet, like the pages of a book, giving complete accessibility.

In the materials handling branch a new development was the E.M.I., Ltd., driverless trolley system. This enables the movement of factory trucks or trolleys to be remotely controlled from a central point. A wire is laid over the desired route and supplied with an a.c. control signal. Sensing coils mounted on the truck are connected to a servo system operating the truck's steering gear, and keep the truck on the correct path. Independent operation of a number of trucks, and changes from one set route to another, are possible by the use of signals of different frequencies sent out by the central control station. It was suggested that this simple system might, in some applications, replace the more expensive conveyor belt installations.

Many end-products require to be weighed to Board of Trade limits before being despatched and several automatically controlled weighers, for this purpose, could be seen, notably on the stands of Avery, Ltd., and Elliott-Automation, Ltd. In the latter case, packages were dropped from a conveyor on to a weight sensing device working on a null-balance system. Weight is detected by a capacitor with a moving plate and movement is opposed by a feedback signal applied to a moving coil. The coil current is proportional to weight to within 0·2 per cent accuracy and operates a recorder and a sorting device which rejects underweight packages. Rates of weighing up to 300 a minute are possible.

Many displays illustrated the fact that automatic control is a method, rather than a product, so that the systems shown in operation were just examples of what could be achieved. In any practical application a system of control must, in general, be "tailored" to the individual needs. The chief difference, in this respect, between this exhibition and last year's was the extent to which the principles of automatic control had actually been put into practice. Most of the component devices which made up the control systems were equally available last year, when we were told in many cases how they *would* or *could* be used. This year there are a multitude of demonstrations which show how they *are* being used. It is an agreeable impression of progress that is gained from this assurance that the schemes which, a few years ago, were ideas or suggestions are now, in so many cases, fact, and are indeed providing at least some of the hoped-for benefits by way of increased production efficiency.

VIEWS on the NEWS

By REFLECTOR

BY placing oil heaters on the same footing as gas and electric heaters in the matter of purchase tax the Chancellor of the Exchequer has remedied an obvious injustice. I have seen no reports of protests by makers of oil heating appliances and so they are presumably recognising the justice of the Chancellor's decision. But I would like to see them making representations a little later when they might join with the gas and electricity people in urging the total removal of the tax from domestic heating equipment.

* * *

A reader has sent me a copy of a supplement of the *Birmingham Weekly Post* illustrating and describing a Homes and Gardens Exhibition held at Bingley Hall. He particularly calls my attention to a general view in the background of which is a large inscription, "Electricity Gives You Value for Money." It is flanked by two Midlands Electricity Board monograms (M.E.B.), but these, in turn, are in close proximity to posters bearing the initials of a local firm of brewers, "M. & B.," and an even larger similar one overtops the Midlands Board's sign. It all makes a rather effective tableau.

In the same supplement a reporter waxes lyrical about 4,000 jets of water

> "pumped by 19 electric motors, and beneath powerful lights of many colours, they simulate all the grace of Pavlova, the majesty and awe of a storm at sea, the prodigality of the Arabian Nights as they scatter amethystine showers of jewels with rich abandon."

All this, of course, could be done only by electricity.

* * *

I hear that Viscount Chandos, the chairman of Associated Electrical Industries, Ltd., has been made an honorary Texan. He shares this honour with other distinguished men including Sir Winston Churchill and Mr. Harry Truman. American films have accustomed us to regarding Texans as somewhat taciturn men who are pretty "quick on the draw." Lord Chandos doesn't seem to fit into the "pictures" although he is now (according to the chairman of the Nomination Committee) "permitted to wear cowboy boots and a 10-gallon hat at all times."

* * *

The offer of free gifts to purchasers of gas cookers has caused the North Western Council of the National Chamber of Trade to protest to the North Western Gas Board. The letter states, *inter alia*, "One wonders what inducements you will be called upon to offer next to sell gas cookers and we may even reach the foolish stage where the Gas Board gives away electrical radiators and appliances whilst the Electricity Board in return makes free issues of gas fires and pokers." I do not know the nature of the "free gifts" mentioned but very much doubt whether anyone would buy a cooker on that account alone.

* * *

Short of pulling down and rebuilding our houses, there are limitations to the extent to which most of us can live electrically, however keen we may be. When planning a new house, however, an invaluable opportunity is presented to those in the industry to set a good example to others. I was pleased to read in the *Bucks Herald* of one member of the staff of the Eastern Electricity Board who is doing so. Mr. T. Gristwood, a commercial assistant with the Board, is building an all-electric bungalow at Whitchurch, near Aylesbury, in which electric floor heating is being installed, the money that would have been spent on chimneys and fireplaces being used on insulation of the building. Mr. Gristwood has improved on the usually accepted standards of adequate electrical installations by having the living room fitted with 14 electric points, some near the floor and others higher on the walls to take lamps and other fittings.

* * *

Referring in a recent issue to improvements at an Electricity Board showroom, the *Gravesend and Dartford Reporter* says:—

"Business should be brisk now that the Harmer Street showroom of the South Eastern Electricity Board has been redecorated. Cheered by the bright coloured walls and ceiling, the staff will double their efforts with new found energy and the public will be much more easily persuaded to buy."

Traders and others may care to note that the colours chosen are yellow and grey walls with a red ceiling.

* * *

A note from a correspondent published in the *Electrical Review* of 27th April, 1888, drew attention to a novel form of polarity indicator which does not seem to have been widely adopted—possibly because of its seasonal nature. The note ran as follows:—

> "A German paper publishes a curious experiment by Prof. L. Herman, the physiologist. He placed a number of tadpoles in a basin of water, and submitted them to the action of a current from a small electric battery, with the result that they acted as magnetised needles would under similar conditions—that is to say they exhibited a decided polarity. Their heads pointed towards one of the wires, but when the current was reversed they immediately turned their bodies, and poined the other way. If this be true the curious conclusion is arrived at that a telegraphic message could be deciphered through the medium of living tadpoles in lieu of magnetised needles."

PERSONAL AND SOCIAL

News of Men and Women of the Industry

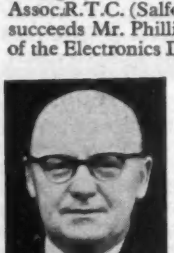
The Minister of Power has reappointed the following chairmen of Electricity Consultative Councils:—London, **Ald. I. J. Hayward,** LL.D., J.P.; South Eastern, **Ald. Commander D. S. E. Thompson,** R.N. (Retired), Whitstable, Kent; South Western, **Lady Carew Pole,** Torpoint, Cornwall; Midlands, **Ald. the Reverend R. A. Giles,** Shifnal, Shropshire; and North Western, **Councillor F. Kenyon,** J.P., Oldham.

Mr. W. C. Purdy, at present commercial engineer of the Cromer District, has been appointed commercial engineer of the King's Lynn and Western District, Norfolk Sub-Area, Eastern Electricity Board.

Mr. W. C. Purdy

Mr. Purdy was educated at the Needham's School, Ely. He received his early technical training with the Beds., Cambs. & Hunts. Electricity Co. at the opening of the public supply of electricity in the city of Ely and later he was transferred to the Newmarket Electric Co. He went to Cromer in 1938 as commercial assistant to Mr. W. J. Scarff, the resident manager, and in 1941 joined the R.A.F., being commissioned in 1942. Mr. Purdy was appointed commercial engineer at Cromer upon the formation of the Cromer District in 1949. Mr. Purdy represents his district on the management committee of the Cromer and District Chamber of Trade and Commerce.

Mr. L. H. J. Phillips, B.Sc., sales manager of the Electronics Department of the Metropolitan-Vickers Electrical Co., Ltd., has been appointed assistant commercial manager, and **Mr. A. G. Barton,** Assoc.R.T.C. (Salford), A.M.I.E.E., succeeds Mr. Phillips as sales manager of the Electronics Department.



Mr. L. H. J. Phillips

Mr. A. G. Barton

Mr. Phillips is an honours graduate of the University of Wales and a prizeman and medallist of University College, Cardiff. He became a college apprentice with Metropolitan-Vickers in 1927, and in 1928 joined the staff of the Research Department, where he remained until 1941 when he was appointed assistant superintendent and later head of the Radio Department of the Royal Aircraft Establishment, Farnborough. In 1942 he was transferred to the Ministry of Aircraft Production as Deputy Director of Communications Development, a position which he held until 1945 when he returned to Metropolitan-Vickers as sales manager of the newly-formed Radio Department. He became sales manager of the Electronics Department in 1955.

Mr. Phillips has been a member of the Radio Industry Council and is a member of the Council of the Electronic Engineering Association, of which body he was chairman in 1951. He represents the Association on the Telecommunications Industry Committee of the British Standards Institution.

Mr. Barton, who received his technical education at the Royal Technical College, Salford, joined Metropolitan-Vickers as a school apprentice in 1939. Joining the Forces in 1943, and with the rank of captain, R.E.M.E., he served in India and S.E.A.C. Returning to the company in 1947 he joined the Birmingham office as sales engineer on industrial equipment, and was transferred to the Electronics Department as sales engineer in 1955.

Mr. N. D. G. Robertson, who has been managing director of the Non-Ferrous Die Casting Co., Ltd., since the company's inception, has resigned from the board. He will, however, continue to act in the capacity of consultant. His son, **Mr. N. D. G. Robertson,** has been appointed to succeed him as managing director, and **Mr. G. C. Praill** has been appointed a director of the company.

Mr. A. Farrer, A.M.I.E.E., has been appointed district engineer, Bristol, of the South Western Electricity Board. Mr. Farrer was previously the Board's engineer for the Bath District. He was educated at Burnley Grammar School and Municipal College and entered the electricity supply industry in 1921 when he joined the Burnley Corporation Electricity Department. From 1931 to 1938 he was district mains engineer at Grimsby, and then joined Bath Corporation where he was mains superintendent from 1946 to 1948. During the war he served as a captain in the R.E.M.E. Shortly after nationalisation of the industry Mr. Farrer was appointed district engineer at Bath.

Mr. H. G. Cutler, general manager of Egen Electric, Ltd., has been appointed a director of the company. Mr. Cutler, who has been associated with the radio industry for thirty years, joined Egen Electric as works manager on the company's formation in 1946. He was appointed to the position of general manager in 1954.

Mr. H. G. Cutler

The South of Scotland Electricity Board has made the following appointments and changes in designation in the Chief Engineer's Department:—System design engineer, **Mr. W. L. Kidd,** B.Sc., M.I.E.E., A.M.I.C.E.; transmission / distribution engineer (operation), **Mr. G. S. Wilton,** B.Sc., A.M.I.E.E.; engineering assistant to the chief engineer, **Mr. G. G. Smail,** B.Sc., M.I.E.E.; principal assistant engineer (system design—transmission), **Mr. M. D. Kippen,** B.Sc., M.I.E.E.; principal assistant engineer (system design — distribution), **Mr. J. H. Field,** M.I.E.E.; principal assistant engineer (distribution), **Mr. R. A. Baird,** B.Sc., A.M.I.E.E.; and principal assistant engineer (transmission), **Mr. J. R. S. Mair.**

Mr. Kidd has been engineering assistant to the chief engineer since the formation of the Board in 1955. Previously he was planning and development engineer with the South West Scotland Electricity Board, which position he had held since 1949.

Mr. Wilton was appointed transmission engineer in January last. He was transmission engineer with the South East Scotland Division of the C.E.A. from 1948 until 1955 when he was appointed principal assistant engineer (transmission) with the South of Scotland Electricity Board.

Mr. Smail has been principal assistant engineer (system design) since 1955. Previously he had been technical engineer in the South East Scotland Division of the C.E.A.

Mr. Kippen has been principal assistant engineer (distribution) since 1955, having been since 1949 technical engineer with the South East Scotland Electricity Board.

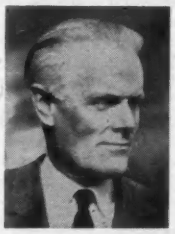
Mr. Field has been senior assistant engineer (system design) since 1955. From 1948 until 1955 he was assistant planning and development engineer with the South East Scotland Electricity Board.

Mr. Baird has been senior assistant engineer (technical) with the Board since 1955 and held a similar appointment with the South West Scotland Division of the C.E.A. from 1952 until 1955.

Mr. Mair is at present principal assistant engineer (construction). From 1948 until 1955 he was senior assistant engineer (transmission) with the South West Scotland Division of the C.E.A.

Gold watches, marking the completion of twenty-five years' service with the company, were presented to ten employees of **James Neill & Co. (Sheffield), Ltd.**, on the occasion of the recent annual works dance at the Cutlers' Hall. This brings the total of recipients of the award up to ninety-two. The dance was held on two consecutive nights when the chairman of the company (Colonel F. A. Neill) and directors entertained upwards of 1,000 employees and friends each night.

In our last issue we reported the appointment of **Mr. I. C. Williams** as district manager for Newport for the South Wales Electricity Board, and we now reproduce his portrait. Mr. Williams has previously been senior assistant engineer at the Board's Eastern Sub-Area headquarters at Cwmbran.



Mr. I. C. Williams

Ruston & Hornsby, Ltd., have made the following recent appointments in the sales division:—**Mr. G. Anselm,** export manager for Europe, Africa and all Middle East territories; **Mr. K. Wickham,** export manager for the Far East and Australasia; and **Mr. J. Bennett-Powell,** export manager for Canada, the United States and South America.

In last week's issue (p. 734) we included a short account of the April luncheon meeting of the Electrical Industries Club at which Sir Christopher Hinton, chairman, Central Electricity Generating Board, was the guest speaker. The accompanying photograph taken at the luncheon shows Sir Christopher with Mr. A. F. Plummer, president of the Club. Mr. Plummer, it will be recalled, has now been succeeded as president by Sir John Hacking.

In dealing with the annual general meeting of the Club it was stated that the general committee for 1958-59 consisted of Messrs. H. de A. Donisthorpe, J. Mortimer-Hawkins, J. J. Thompson,

Sir Christopher Hinton, chairman, Central Electricity Generating Board (left), with Mr. A. F. Plummer, president of the Electrical Industries Club, at the Club luncheon in London last week

and H. F. Wickham. The committee does in fact consist of twelve members; the names given were those of the four re-elected members.

The eighth **Edmundsons Reunion** (members of the staff of the former Edmundsons group of companies) was held at the Café Monico, London, on 11th April. In the chair was Mr. W. E. Brandreth, formerly general manager of the Wessex Electricity Co., who is now eighty-three years of age. His reminiscences of his experiences in electricity supply were of considerable interest to his audience of over 150, many of whom had travelled considerable distances to attend. Mr. R. H. M. Barkham, chief commercial officer of the Eastern Electricity Board, and Mr. E. C. Mekie, formerly secretary of Edmundsons, also spoke. Among those present were Mr. R. R. B. Brown, chairman of the Southern Electricity Board, and Mr. A. M. Scott, financial adviser to the Electricity Council.

Mr. W. Stainsby, B.Sc.(Hons.), A.M.I.Mech.E., A.M.I.C.E., education officer of Electroflo Meters Co., Ltd. (member of the Elliott-Automation Group), has been elected chairman of the Education Sub-Committee of the British Instrument Makers' and the Control Appliance Manufacturers' Association.

The North Western Area Competition of the **Electrical Industries National Golf Championship** will be held on 7th May at Stockport (Torkington) Golf Club. Particulars can be obtained from Mr. J. K. Dean, Ship Canal House, King Street, Manchester, 2. The National Finals of the competition will be held at Wentworth Golf Course, Virginia Water, Surrey, on 29th September.

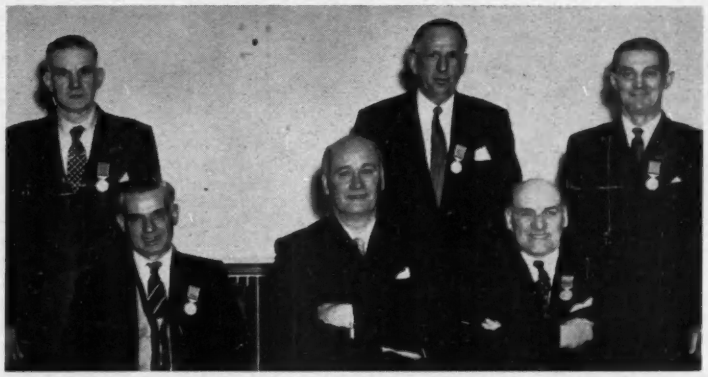
Mr. H. Fisher, M.S.M.A., has joined Astral Switchgear, Ltd., as its London area technical representative. During the previous eight years he was general manager of Channel Conduits, Ltd.

Mr. A. Leggett, M.B.E., M.I.Mech.E., M.I.Prod.E., chairman and managing director of Bull Motors (E. R. & F. Turner, Ltd.), has retired from active business after sixty-six years of service with the company. A presentation and dinner was held to mark the occasion at the Great White Horse Hotel, Ipswich, on 11th April, and was attended by many of his business friends and colleagues.

Mr. A. Leggett

Mr. Leggett started as an apprentice with his firm in 1892, became a director in 1918, and managing director in 1932. At the request of his fellow directors he will continue as chairman of the company. He is

Members of the electricity supply industry who were recently presented with the British Empire Medal by Lord Mills, Minister of Power, on behalf of the Queen, with Sir Henry Self, chairman of the Electricity Council. Back row: Messrs. F. Farnsworth, leading driver, steam turbine, East Midlands Division, C.E.G.B.; G. Cook, chargehand fitter (electrical), North Eastern Division, and W. O. Handy, leading stoker, Stourport "B" power station, Midlands Division. Front row: Mr. S. Oliver, overhead linesman, North Western Electricity Board; Sir Henry Self; and Mr. F. W. Symmonds, foreman meter reader, Harrogate Sub-Area, North Eastern Electricity Board



succeeded by his two sons, **Mr. P. A. Leggett** and **Mr. A. H. Leggett,** as joint managing directors. Two new directors have been appointed to the board, **Mr. C. B. Wyatt,** M.I.E.E., and **Mr. A. R. Roote. Mr. J. E. Wright** continues as director and company secretary.

The chairman of the Organising Committee of the Instruments, Electronics and Automation Exhibition, which concludes to-day (Friday) at Olympia is **Mr. E. W. Semmens,** A.M.I.E.E., managing director of Nalder Bros. & Thompson, Ltd. Mr. Semmens is also chairman of the Instrument Section of the British Electrical and Allied Manufacturers' Association.

Mr. E. W. Semmens

Mr. H. H. Gott, M.A., A.M.I.Mech.E., chief engineer, reactor design, in the Industrial Power Branch of the United Kingdom Atomic Energy Authority, has been appointed nuclear plant design engineer of the Central Electricity Generating Board.

We reproduce herewith the portrait of **Mr. C. G. Maisey,** who, as we reported last week, has been appointed chairman of Walsall Conduits, Ltd. Mr. Maisey joined the company's predecessor, the Walsall Hardware Manufacturing Co., Ltd., in 1913, and when Walsall Conduits was made a public company in 1936 he was appointed a director of the company.

Mr. C. G. Maisey

Recent visitors to Britain in connection with the Siemens Centenary were the three managing directors of the company's overseas companies in Australia, Canada and South Africa. They were here to renew contacts and tour the production divisions of Siemens Edison Swan, Ltd. They also visited "Zeta" at Aldermaston for which Siemens Edison Swan supplied cables. The accompanying photograph shows, left to right: Mr. H. T. Wormell (managing director, Siemens Brothers (Canada), Ltd.); Dr. J. N. Aldington (managing director, Siemens Edison Swan, Ltd.); Mr. R. C. Hamilton (managing director, Siemens British (Pty.), Ltd., of South Africa); Mr. J. A. Duggan (managing director, Siemens (Australia) Pty., Ltd.); Mr. B. A. Hensler (managing director, Siemens Edison Swan (Export), Ltd.); Mr. Wormell and Mr. Duggan have now returned to their countries, but Mr. Hamilton is staying in the United Kingdom until the end of April.

Dr. J. N. Allington and Mr. B. A. Hensler with Siemens overseas visitors

The tenth annual dinner of the **Southern Meter Engineers' Technical Group** (founded in 1943) of the Electrical Power Engineers' Association was held on 18th April, Mr. R. Thompstone (chairman) presiding, supported by Mr. W. G. Slater (vice-chairman). The attendance of 183 members and guests was stated by the hon. secretary (Mr. O. G. Davis) to be the largest yet.

Only two toasts were on the agenda, but these were supplemented by a number of others in like humorous vein, encouraged by the honorary toast master, Major T. O'Dea. The health of "Our Guests" was proposed by the chairman, who mentioned in particular those who had given lectures of exceptional quality during the past session. He viewed with some horror certain proposals that had been mooted of any integration with gas; if these ideas came to anything, he supposed they would come to be known as "gastric engineers." Response was made by Mr. R. J. Smith, who was seconded by Mr. M. Kaufmann.

Thanks to "The Chairman" was voiced by Mr. A. M. F. Palmer, M.P., who also referred to his own earlier experiences as a protective engineer with the London Power Co. before becoming national secretary of the E.P.E.A. technical groups. Seconding, Mr. B. Yardley pointed out that the title of "meter engineers" did not adequately convey the range of activities with which the group was concerned and said he would favour some appropriate modification of the title. Comedy entertainment was provided once more by Mr. Charlie Pheby (a member) and by Mr. Gordon Turner at the piano.

At last Friday's dinner-dance of the Sheffield Sub-Centre of the Institution of Electrical Engineers. Left to right: Mr. J. Sykes (hon. secretary) and Mrs. Sykes; Dr. O. I. Butler (chairman) and Mrs. Butler; and Mr. F. Seddon (hon. treasurer) and Mrs. Seddon

As part of the policy of expansion envisaged with the formation of Lancashire Dynamo Group Sales, Ltd., the Lancashire Dynamo Group has opened a new sales and service office at 12, Princes Street, Ipswich (telephone: Ipswich 56141/2), and **Mr. B. L. Perkins,** B.Sc., A.M.I.E.E., has been appointed manager of the eastern area office.

Mr. B. L. Perkins

Mr. Perkins, who commenced his engineering career with Lancashire Dynamo & Crypto, Ltd., in 1928, relinquished his position as general sales manager of Foster Transformers, Ltd. (a Lancashire Dynamo Group company), at the end of last year in order to take up his new appointment. The territory covered from this office will include Suffolk, Norfolk, Cam-

bridgeshire, Huntingdonshire and the northern half of Essex.

Mr. H. P. Bridge and **Mr. D. C. Akester** have joined the board of Vent-Axia, Ltd., and **Mr. C. M. Courage** has resigned therefrom. **Mr. R. S. Hunter** has joined the board of the subsidiary company, Axia Fans.

Mr. E. J. Hunter, chairman of Swan, Hunter & Wigham Richardson, Ltd., has been elected president of the North East Coast Institution of Engineers and Shipbuilders for 1958-59.

At the annual general meeting of the **Batti-Wallahs' Society** held on 15th April Mr. H. H. Spencer, director and general manager of Rustyfa, Ltd., was elected president for 1958-59. Mr. T. C. F. Bigland and Mr. J. Temple Hazell were re-elected hon. secretary and hon. assistant secretary, respectively, and the following members were elected to the Committee:—Messrs. J. S. A. Bunting, M. D. Cloran, H. A. Crabtree, K. Druce, J. B. Scott and G. H. L. Smith.

OBITUARY

Mr. J. H. Pawley.—The death occurred on 15th April, at the age of seventy-eight, of Mr. John Hampton Pawley, a director of George Cohen, Sons & Co., Ltd., whom he joined fifty-one years ago. Up to last December Mr. Pawley was in control of the company's dismantling activities.

Mr. S. A. Harrowell.—The death occurred suddenly on 12th April at the age of 53 of Mr. S. A. Harrowell, joint managing director of the Progress Cables & Accessories Co., Ltd., of which he was a founder director. He had been actively connected with the electrical trade for nearly 35 years.

Mr. M. Swift, of the Trafford Park Works of Lancashire Dynamo & Crypto, Ltd., died on 14th April. Mr. Swift joined the company's Trafford Park Works as an apprentice in August, 1907. He was employed in the Contracts Department until recent years when he was transferred to the Estimating Department.

Mr. R. V. Broberg, a director and a founder member of the Airedale Electrical & Manufacturing Co., Ltd., died on 17th April. Mr. Broberg was born in 1889 and was educated at Brighton Technical College. He received his practical training with the Lancashire Dynamo & Motor Co. and in 1912 was appointed chief designer with Horace Green & Co. In 1918 he joined Armstrongs & Main, Ltd., Glasgow, and two years later commenced his association with the Airedale Electrical & Manufacturing Co. Mr. Broberg was also a director of Applied Radiation.

WILLS

Mr. H. Allwood, A.M.I.E.E., founder and director of Dacier, Ltd., who died on 25th December last, left £7,582 gross (£7,516 net).

Mr. C. G. M. Pitcher, former London manager of Premier Electric Heaters, Ltd., who died on 12th January last, left £5,480 gross (£4,800 net).

Parliamentary Report

Coal Prices

In the House of Commons last week Mr. Palmer asked the Paymaster General if, in the national interest, he would give a general direction to the National Coal Board to co-ordinate charges for coal to the publicly owned electricity and gas industries with those for grades of fuel sold to other industries generally.

Mr. Maudling replied that the price adjustments made by the Coal Board on 17th March took account of prospective supplies of the scarcer coals, particularly large and graded coals. He did not consider that the prices charged to the public utilities and to other industries were out of balance. Questioned further, he said the purpose of the recent price changes was to discourage the use of large coal by general industry and as the electricity industry was not a user of large coal it did not come within the scheme. The idea was to adjust the price as between large and small coal used in industry so as not to put a larger cost burden, in total, upon industry.

Gas-Electricity Co-operation

Mr. Palmer asked the Paymaster General why the Committee of Investigation into possible improved co-operation between the electricity and gas industries had been empowered to consider only the performance of statutory functions and the administration of services of a like kind, in spite of a previous ministerial statement that it should be empowered also to consider alleged unnecessary advertising, hire purchase, capital investment, the economies of meter reading and the sale of appliances; and to what extent this represented a considered change in the policy of the Government.

Mr. Maudling said there had been no change in Government policy. The Committee had been set up to consider how by co-operation between the gas and electricity industries the administration of services of a like kind provided by them to the public might be improved. In carrying out their inquiries the Committee were free to consider any of the subjects mentioned by Mr. Palmer in so far as they regarded them as relevant.

European Free Trade

In reply to a question about the progress being made towards the establishment of a European Free Trade Area, the Paymaster General said that while he could not admit that the negotiations had reached deadlock they were certainly going through a difficult stage. That was not unexpected. Unless agreement could be reached on major matters by the end of July (for implementation on 1st January, 1959) there was a great danger that support for the whole idea in the United Kingdom and in other countries would dwindle away to a dangerous extent.

School Science Laboratories

The Minister of Education (Mr. Geoffrey Lloyd) informed Mr. Owen that projects costing some £2 million had been included in the 1958-59 building programme for additional science accommodation for grammar and technical schools. He had recently invited local education authorities to submit proposals for further improvements of this kind so that he could consider their inclusion in the 1959-60 building programme.

Contract Price Formulæ

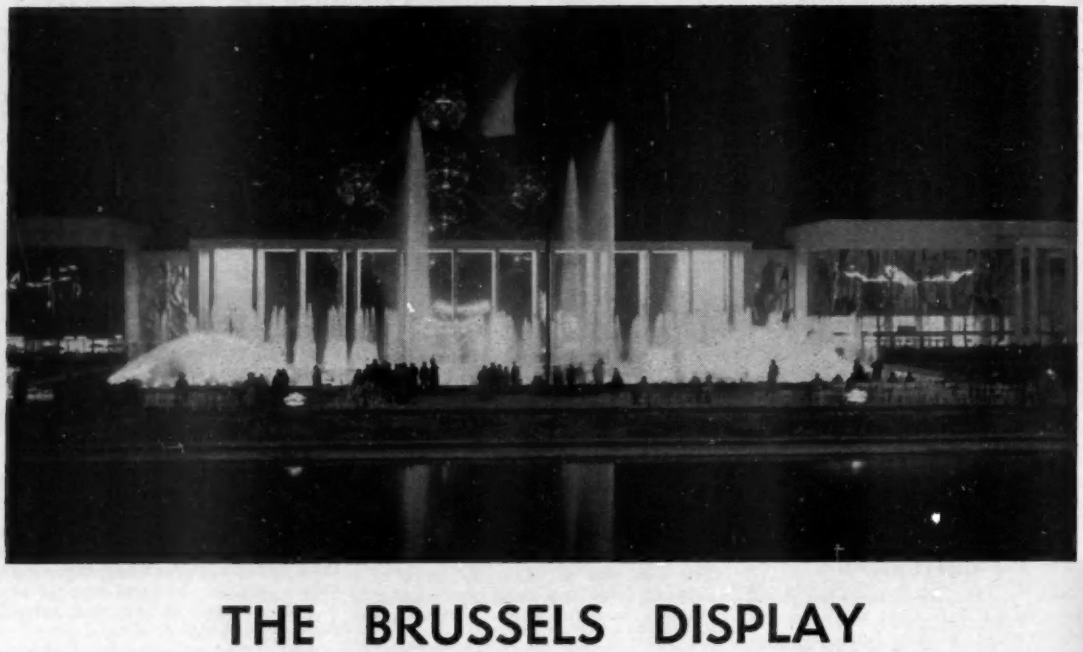
The British Electrical and Allied Manufacturers' Association has issued the figures for its contract price adjustment formulæ. In each case the rate of pay for adult male labour at 18th April is deemed to be 186s 6d.

The "costs of materials" figures are: For electrical machinery and equipment the Board of Trade index figure published on 18th April is 177·2 (1949=100) and 114·1 (1954=100); both figures are provisional. For turbo-generating and allied plant: Materials used in mechanical engineering industries 185·6 (1949=100) and 123·3 (1954=100), blast furnaces and iron and steel melting and rolling (40 and 41) 192·8 (1949=100) and 131·4 (1954=100); both figures are provisional. The price of ⅜in o/d 18 s.w.g. brass condenser tubes (*Metal Bulletin*, 18th April) is 41d per lb.

Prices of Materials

In the accompanying table we give the basis prices of the more important materials used in the electrical industry. The figures given are the selling prices and are those quoted on Tuesday last.

ALUMINIUM ingots	ton £180 0s 0d
COPPER, H.C. Electro	ton £175 10s 6d
Fire Refined 99·70%	ton £174 0s 0d
Fire Refined 99·50%	ton £173 0s 0d
COPPER Tubes ..	lb 1s 8½d
Sheet	ton £203 10s 0d
H.C. wire and strip ..	ton £226 5s 0d
LEAD, English ..	ton £72 5s 0d
Foreign	ton £71 0s 0d
MERCURY	flask £77 0s 0d
TIN, block (English) ..	ton £730 5s 0d
ZINC, G.O.B. Foreign	ton £62 5s 0d
Electrolytic	ton —
BRASS Tubes (solid drawn)	lb 1s 5½d
Sheet	ton —
Wire	lb 2s 3d
PHOSPHOR BRONZE Wire	lb 3s 6d
PLATINUM	oz £26 15s 0d
RUBBER, No. 1 R.S.S. spot	lb 23½d—23¾d



THE BRUSSELS DISPLAY

Some of the National and International Exhibits

OUR last week's notes on the Brussels International and Universal Exhibition were perforce written before we had had an opportunity of inspecting the Exhibition. We are now able to give some first-hand impressions. At the outset it must be said that when the King of the Belgians inaugurated the Exhibition on 17th April much remained to be done. While most of the more than seventy national and international pavilions had been completed structurally the arrangement of the exhibits in many was far from finished. Indeed it seemed to us that some displays would need a further month's work on them. We are glad to report, however, that the British contribution was more advanced than any other and on the opening day needed only a few finishing touches.

In opening the Exhibition King Baudouin congratulated and thanked those responsible for its organisation and realisation, mentioning particularly the Commissioner General (Baron Moens de Fernig) and members of the Belgian Government. He referred to the Exhibition as a microcosm of the modern world and expressed the hope that it would enable the nations better to understand each other and thereby help to preserve peace.

The two thousand or more journalists who attended the preliminary ceremonies were well fed with statistics by the Exhibition authorities. We learned, for instance, that the total area occupied is 500 acres; that there are over 15 miles of roads (this we can believe !); that the installed transformer capacity is over 60 MW and the electricity consumption is expected to reach 20 million kWh; and that over 45,000 fluorescent lamps and " several hundred " mercury vapour lamps have been installed.

Two central features are really impressive. The first is the Atomium which purports to represent " an elementary crystal of alpha iron." It has a total height of 334ft and consists of nine 59ft diameter bright steel spheres connected by 11ft diameter tubular ways. It weighs nearly 2,000 tons. Then there is the " water stairway " 1,400ft in length and consisting of fifty-three steps 35ft wide over which water cascades with changing coloured light illuminating it.

It is not within our province to describe all the attractions, but we may say that they are many and effective. Nor have we space for descriptions of all the exhibits in the national and international pavilions, but later we mention some of the items which caught our attention during a tour of the Exhibition.

First, we may again make brief reference to the British Government Pavilion. The arrangements are imaginative and aim at illustrating the British way of life, traditions and achievements. We felt a little awed by the cathedral-like entrance hall with its " storied windows richly dight, casting a dim religious light." And some of the items assembled there seemed a trifle strange, such as the T.U.C. silver bell and a judge's wig. Turning off to the left at the end of the " nave " we came straight to a quite impressive panorama of the Dounreay area and were particularly struck by the realistic rolling waves and clouds passing across the face of the moon. For the rest, it may be said that there is great variety in the panoramas and other exhibits; some are instructive and others amusing. The model of ZETA is one of the more practical items.

We are told by Mersey Cables, Ltd., that cables made by them have been used almost exclusively in the Pavilion by the electrical contractors, Troughton & Young, Ltd.

The engineering industry has been responsible for something like two-thirds of the display in the British Industry Pavilion sponsored by the Federation of British Industries through its subsidiary, British Overseas Fairs, Ltd. As we have already said, the largest contribution has been made by the British electrical and allied industries; about 140 firms have participated in the display which was originally estimated to cost £120,000—a figure

which must inevitably be exceeded because of increases in the running cost which were not foreseen. It is the hope of the Organising Committee (36, Kingsway, London, W.C.2) that electrical companies who have not yet joined in will do so, remembering that this is a "prestige" display which should bring benefits to the whole of the industry.

We referred last week to the collection of domestic equipment arranged in an elevated section of the stand, reached by a staircase. In conjunction with this a 44-page handbook has been produced which illustrates and briefly describes (in French, German and English) a representative range of domestic appliances made by the twenty-seven companies contributing to the display. A general introduction is printed in eight languages and copies of the handbook will be presented to interested visitors to the stand.

Model of the P. & O. liner "Canberra" with layout panel and information telephones

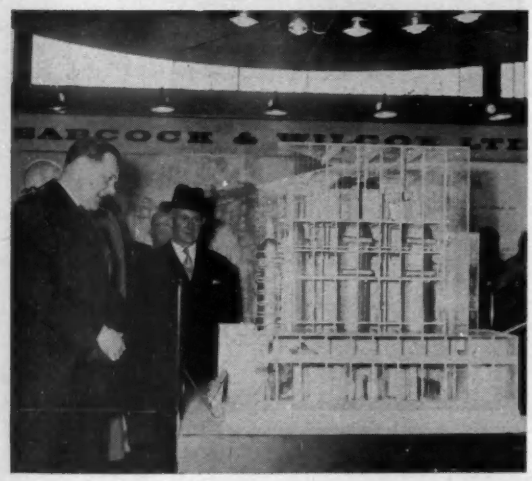
As part of the collective electrical exhibit the P. & O. Steam Navigation Co. has an excellent model of its 45,000 ton liner *Canberra* which is being built at Belfast by Harland & Wolff for delivery in 1960. The ship will be the largest turbo-electric vessel to be built in Great Britain. The propulsion machinery, by the British Thomson-Houston Co., will consist of two 32,200 kVA single-cylinder turbo-generators supplying power to two double-unit 42,500 s.h.p. propeller motors. The model is flanked by sets of three hand telephones through which recorded descriptions of the various parts of the ship, in English, French and German, can be obtained by a dialling system.

In our last issue we made brief reference to the model of a 400 MW nuclear power station staged by the Nuclear Power Plant Co., Ltd. We did not measure it, but we judge it to occupy a space measuring about 50 by 20ft and it is thus quite an imposing assembly. One of the two reactor buildings is sectioned to show the pressure vessel, boilers and ducting; the other is being used as an office. Across the middle of the stand is the turbine hall and in front of this is the switchyard with models of the transformers, transmission line towers and switchgear.

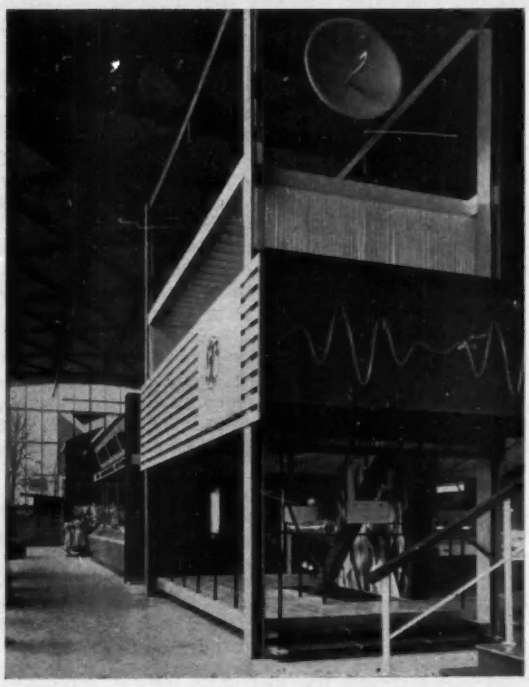
Babcock & Wilcox, whose stand was mentioned in last week's issue, are distributing a handsome trilingual souvenir booklet dealing with their activities in many industries, with special reference to nuclear power. The company is associated with the English Electric Co. and others in the construction of the 500 MW Hinkley Point nuclear station. In the marine section of their display is a model of the reactor and propulsion section of a projected 45,000 ton oil tanker. An artist's impression of a boiler for supplying a 550 MW turbo-generator contrasted with some normal houses gives a good idea of the size of modern boiler plant. A large oil painting by Anna Zinkeisen, symbolising steam in the service of man, dominates the stand.

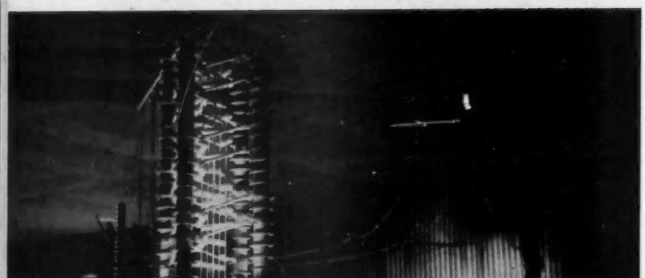
We noticed in the section occupied by the United Kingdom Atomic Energy Authority a sign indicating the output to the grid of the Calder Hall station since it began operation in October, 1956. By the opening date (17th

The British Ambassador to Belgium (Sir George Labouchere) at the Babcock & Wilcox stand



View of the Standard Telephones & Cables display





Impulse generator in the Hall of Electrical Energy

April) a total of 560 million kWh had been recorded.

Another item worthy of mention in the Industrial Pavilion is a large model of the Durgapur (India) Steel Works which is being erected by a British consortium including some of the leading electrical manufacturers.

Upon the stand of the Revo Electric Co., Ltd., are examples of the company's domestic and lighting equipment. Inspection of the mounted public lighting fittings which are shown is facilitated by a balcony built out from the upstairs section of the stand. Other exhibits here are high- and low-speed electronic counters and a precision electronic tachometer.

One of the more interesting international pavilions is the Hall of Science in which the present state of knowledge in a number of fields is demonstrated. The exhibits are grouped under the following four headings:—Nuclear physics; chemistry and physico-chemistry; crystallography; and the living cell. Many ingenious and impressive devices are employed to explain and illustrate researches.

A large proportion of the area of the Exhibition is devoted to Belgian life and industry. One of the buildings —the Electrical Energy Pavilion—is arranged to show Belgium's supply system in relation to that of adjacent countries. Leading Belgian manufacturers have taken space to show the comprehensive nature of the country's electrical industry. Most of the exhibits are of a "bread and butter" nature. A comprehensive collection of domestic appliances has been staged in a gallery and we were puzzled by the many waffle irons shown, as waffles do not seem to figure largely on the Belgian menu.

Among the national pavilions one finds a variety of constructional and internal designs and they all reflect the ideologies of the countries responsible for them. Much has already been said about the Russian Pavilion, an enormous elevated rectangular building. There the visitor is bewildered by slogans and statistics, but upon recovery he will be able to judge that there is solid achievement behind the mist of propaganda. Industry preponderates but culture has an important place. Of course, the *sputnik* and nuclear power are given prominence.

In the nearby United States Pavilion—a kind of flattened Colosseum—American culture is especially emphasised, although a great deal of attention is paid to the industrial side. The International Business Machines Corporation has a spectacular automation section and shows a "random access memory accounting and control" computer guaranteed to "supply the outstanding facts and events for any of the past 1962 years in less than a second's time."

Switzerland naturally exhibits some excellent examples of precision work—particularly in the *horologerie* section. One special item is a quartz clock shown in operation in conjunction with a large international time dial. Electrical equipment also takes up some space and there are outside exhibits by leading electrical manufacturers, including a 400 kV Brown Boveri air-blast circuit-breaker.

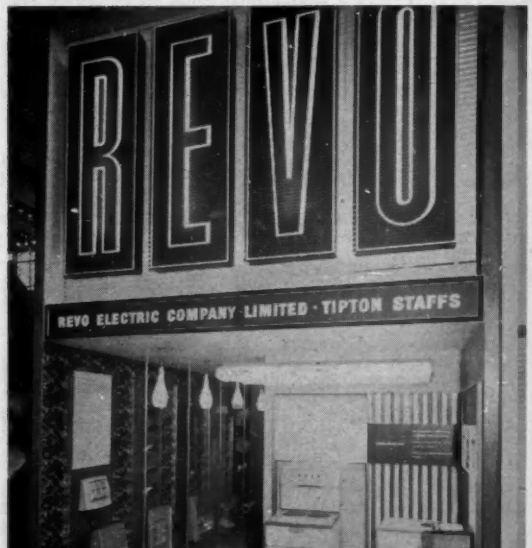
In the Czechoslovakian Pavilion a prominent item is a diagrammatic model of a 150 MW nuclear power station in connection with which it is stated that practically the whole of the country's electric power will be produced in this way by 1975. At present Czechoslovakia relies on water power and lignite-fired thermal stations.

Machine tools form a substantial part of the Hungarian exhibit; among them is the "Erosimat" spark-erosion machine. We found difficulty in obtaining details of this. Some early ring-wound transformers appear in this pavilion and there is a small electro-magnetic rotor stated to have been constructed by Anyos Jedlik in 1828.

The German Federal Republic has an extensive display next door to the British section. When we left Brussels the exhibits were still unarranged but we saw many pieces of electrical machinery and equipment.

No doubt many other of the national pavilions will house items of electrical interest, but they will have to be inspected when those responsible have been able to get them into position. We have no doubt that by the time these notes appear matters will have advanced considerably and so intending visitors need not hesitate to go to what is really a remarkable conspectus of the modern world and its activities.

Part of the Revo stand



CAPITAL INVESTMENT PLANS

Approved Expenditure in 1958-59

DETAILS of the approved capital investment in the coal, gas and electricity industries are given in a White Paper published last week (Cmnd. 415: H.M. Stationery Office, 6d). This brings up to date the information given in a similar publication last year (Cmnd. 132) which also reviewed the long-term investment programmes of the Boards (see *Electrical Review*, 19th April, 1957).

Table 1 summarises the expenditure incurred and proposed. The White Paper points out that, in settling the level of capital investment for 1958-59, it has been necessary for the Boards, in discussion with the Minister, to revise their plans so as to limit their claims on the country's resources.

Table 1.—Capital Expenditure on Fixed Assets, £ Million

Board	Approved, 1957	Estimated, 1957	Approved, 1958
National Coal Board	107	103†	100
Central Electricity Authority (Electricity Council and Boards since 1st January, 1958)*	233	235	239
South of Scotland Electricity Board ...	20	19†	26½
North of Scotland Hydro-Electric Board	21	17†	17
Gas Council and Boards*	59	57	53½
Total	440	431	436

* Financial years April–March. † Actual.

The overall figures for the electricity supply industry are further analysed in Tables 2 (England and Wales) and 3 (Scotland). In England and Wales, expenditure in 1957-58 included work done on 1,700 MW (sent out) of generating plant brought into commission and on further stations and extensions planned for later years. Expenditure on nuclear stations represented continuing work on the Bradwell and Berkeley stations, started in the previous year, and the beginning of work on the Hinkley Point station.

Explaining the effect on the industry of the level of expenditure approved for 1958-59, the White Paper says that work on new power stations previously planned for the next 24 months will now be spread over about 26 months. Completion of the nuclear power programme described in the 1957 White Paper will be postponed a year, and a higher proportion of the total new generating capacity required during the period covered by the programme will be in the form of coal-fired stations at a lower capital cost. There will also be some savings on transmission expenditure.

Table 2.—Electricity (England and Wales), £ Million

Purpose	Estimated, 1957-58	Programme, 1958-59
Generation:		
Conventional stations	100	90
Nuclear stations	21	37
Main transmission	31	31
Distribution	83	81
Total ...	235	239
Distribution (included above):		
Rural development	7·3	6·3
Other new connections	32·2	28·8
Reinforcement of existing systems	36·7	38·2
Workshops, depots, stores, garages, offices, etc.	2·3	2·7
Other expenditure, including standardisation	4·3	4·7

On the distribution side, it is noted that, with more remote premises brought in, the average cost of connecting rural consumers in England and Wales has risen from £110 in 1954-55 to £154 in 1957-58. Despite this, rural electrification continued at a high rate last year and the number of farms connected in the twelve months to 31st December was 12,248 compared with 13,539 in the previous year. This made the total number served from the public supply 197,007, representing 71·9 per cent of all the farms in England and Wales. Even with the limitations on capital expenditure, the Boards should still be able to achieve their ten-year programme of connecting 85 per cent of the farms in the country by 1963. The reinforcement of distribution networks, as well as the replacement of non-standard systems, will be delayed to some extent, and the Boards have reduced their planned expenditure on workshops, depots, etc.

In the South of Scotland new steam generating plant with an installed capacity of 102·5 MW was brought into service last year and work was started on the Hunterston nuclear station. Extension of supplies to rural communities advanced steadily; with the 677 farms connected 80 per cent of those in the Board's area are now receiving a supply.

Of the proposed expenditure on generation this year (£17 million), the Hunterston station accounts for half and most of the rest is in respect of the Kincardine coal-fired station. The distribution programme is being curtailed mainly by restricting expenditure on reinforcement works and by keeping non-operational items to the minimum. Nevertheless, the Board hopes to connect some 23,400 houses and 840 farms this year; expenditure on rural distribution will amount to about £800,000. Advances by the Secretary of State during 1957-58 totalled £12 million.

Table 3.—Scottish Boards, £ Million

Purpose	South of Scotland		North of Scotland	
	1957	1958	1957	1958
Generation	9·76	17·00	13·14	12·40
Transmission	2·15	2·50	1·32	1·80
Distribution	6·70	6·40	2·35	2·80
Other	0·63	0·60	0·07	0·05
Total ...	19·24	26·50	16·88	17·05

The North of Scotland Board's approved capital expenditure on fixed assets in 1957 was £20·8 million, mainly for hydro-electric schemes already in hand, while actual expenditure amounted to £16·88 million. No new projects were begun, but generating plant with an installed capacity of 103 MW was brought into service and the Lawers project was completed. A further 12,400 consumers were given supplies for the first time, including 2,065 farms and crofts, with the result that 88 per cent of potential consumers in the crofting counties are now receiving a supply. The average cost of connecting premises in the rural areas is at present about £350. The proposed expenditure on generation this year includes provision for starting the Loch Awe and the Strathfarrar and Kilmorack schemes. Advances by the Secretary of State during 1957-58 amounted to £17·4 million.

F.B.I. NUCLEAR ENERGY CONFERENCE

DISCUSSIONS AT EASTBOURNE

LAST week we published summaries of the papers read at the Federation of British Industries' conference on nuclear energy at Eastbourne. After Mr. E. F. Schumacher had delivered his paper on nuclear energy and the world's fuel and power requirements Mr. J. Brodrick (English Electric) said he felt that perhaps the danger point was a little further off than Mr. Schumacher imagined.

Sir Norman Kipping, director general of the Federation, opened the discussion on the paper on financial and investment aspects presented by Mr. Brodrick and Mr. J. R. Cuthbertson. He said that one could only look at judgment about rates of interest in terms of determination to see the end of " those demoralising conditions: the end of inflation." It would not be realistic for us to-day to think that natural forces would ever again be allowed full and unrestricted rein.

Regarding the effect of technological advances on the cost of nuclear power, Mr. Cuthbertson said one must believe that there was a great deal behind the optimism on the part of the experts that capital costs must eventually come down. Therefore, they should not waste resources on building too many power stations now without regard to whether or not they were economical.

The discussion was wound up by the chairman, Mr. H. W. West (A.E.I.-John Thompson), who said it sounded nice to hear the economist say " If you wait awhile everything will come down." That was a fallacy. The engineering industry had learned by performing, and only by performing, and in that way had brought about the improvements for which they had all been waiting. That was shown by the differences between Calder Hall and the stations which were following it.

Ship Propulsion

Dr. D. J. Littler, who presented a paper on reactor types, was asked about reactors for shipping. He replied that various systems were being considered for ship propulsion. As far as submarines were concerned the *Nautilus* type seemed to be most suitable. It was, however, expensive to run and for shipping one would want to use something more economical. Three reactor systems were being looked at, all of which were relatively small and could go into shipping. One was a scaled-down version of the Calder Hall type, the second a gas-cooled heavy water system, and the third an organic liquid moderated type.

Dr. A. T. Bowden referred to suggestions that in Western Europe attempts had been made to enrich uranium more cheaply than by the diffusion process. He wondered if there would be a break-through, as there was with heavy water, which would encourage a country to go in for pressurised water reactors. While agreeing that the situation would alter appreciably if there was a fall in the price of enriched uranium, Dr. Littler said he would not like to prophesy about a possible break-through.

Radio-isotopes provided the subject for Friday's opening session, when Mr. W. G. Busbridge (Isotope Division, U.K.A.E.A.) was the speaker. Mr. Kenneth Marshall, of the Joint Iron Council, wondered whether isotopes might be used to detect the movement of dust and smoke clouds in a work place while workpeople were operating. Mr. Busbridge felt that it would be a bad thing to expose people to radiation.

Mr. Busbridge told another delegate that cobalt 60 was suitable for making radiographs of steel plates up to 6in thick. Cost was small, although exposures tended to be fairly long. The only way to speed up the work would be to place more objects within the field of radiation or use a bigger source of radiation.

Mr. L. Grainger, who presented a paper on new materials for nuclear engineering, was questioned by Dr. P. J. Garner (Shell Research, Ltd.) about the insulation of a reactor shell on the inside, possibly with refractory concrete. It was a technique used quite widely in the petroleum industry.

Mr. Grainger said that space inside a pressure vessel was precious. One had to get things in and out of the reactor core and this caused some difficulty, particularly when considering that part of the temperature of the shell was due to neutron absorption, and the effect of neutrons streaming down channels which had to be kept clear.

The use of uranium silicide in reactors would not be exploited during the next ten years, Mr. Grainger said in answer to another question. Its priority was never high and was lower now than it had ever been. For the moment they were pinning their faith on uranium dioxide. Uranium silicide remained an interesting possibility, but there was more than one silicide and the study was most complex.

Extent of Instrumentation

Referring to the paper on reactor instrumentation presented by Mr. M. V. Needham, the chairman, Mr. D. D. Walker (Evershed & Vignoles), said it seemed that a lot of instrumentation was put in reactors and he wondered whether this was due to the high degree of caution necessary in a new technique. Was it possible, as techniques improved and more experience was gained, that the amount of instrumentation would be reduced, or would we always be saddled with a high percentage of reactor instrumentation compared with that of a conventional power station? Mr. Needham replied that although a large amount of money was spent on instrumentation, proportionately it was quite small.

Mr. Kenneth Marshall (Joint Iron Council) asked about the type of operator required, whether scientists of any particular level would be necessary, or whether instrumentation would be of such an order that less-skilled personnel could be trained in the routine. He also asked whether it would be possible to carry out test checks while an instrument was working. Answering the last point first, Mr. Needham said a check was possible, such as by the injection of test currents or pulses. Dealing with the point about operators, he said he thought it not a fundamental requirement that an operator should have a high technical knowledge. But he did need a high sense of responsibility. In the design of reactor instrumentation, it was endeavoured to ensure safety whatever the operator might do.

The last paper of the conference dealt with the fabrication and processing of fuel elements, and was presented by Mr. C. Buck. In answer to a question about costs he said that a fuel-element line, covering just the fabrication of the fuel element and purchasing everything one could from industry, to handle ten such reactors would be to the

order of £200,000. This would include health requirements. Taking it a stage further, the plant required to process the active elements after removal from the reactor would cost somewhere in the region of £300,000 to £400,000.

Sir Claude Gibb took the chair for the closing session, a general discussion and summing-up. 'Commenting on tendering and the waste of technical manpower involved, Sir Claude said that Parliament, or public opinion, would not accept that there was competitive tendering unless a minimum of four tenders was submitted. The cost of preparing a tender for a nuclear power station was extremely high and with a programme for Britain that at the moment looked like being no more than two nuclear stations a year ordered, with the number of firms tendering there would inevitably be a very serious waste of technical effort and manpower. In a democracy, however, no other solution seemed politically acceptable.

Calder Hall Operation

THE paper on "Operational Experience at Calder Hall," which was presented by Mr. K. L. Stretch at the Institution of Electrical Engineers on 16th April and reported in our last issue, was opened by Mr. R. A. Peddie (C.E.G.B.), who asked for further information on the provisions for maintenance and for a figure for the word "negligible" in regard to irradiation. Mr. R. F. Jackson (A.E.R.E., Harwell), remarking that the measurement of fuel element temperatures required long thermocouple leads, wondered whether measuring gas outlet temperatures only would be an adequate guide to the shift in flux conditions over the reactor core during operations.

Period of Tests

Dr. J. Shaw (Metropolitan-Vickers) said that the tests during the commissioning of the two Calder reactors were to indicate the technical and economic feasibilities of the type of reactor, to confirm its safety and to establish its limitations. In the light of the experience gained, was it, in the author's view, essential to carry out as exhaustive a programme of tests on the other identical reactors, such as Calder Nos. 3 and 4 and Chapel Cross? Could not the commissioning period be considerably reduced by carrying out only a few essential tests? Mr. D. Bolton pointed out the difference in scale between the Calder Hall station and the C.E.G.B. stations. Would the author recommend a change in commissioning procedure or would he apply the same procedure over a larger time scale?

Mr. G. C. Allingham asked what were the essential differences between a reactor designed primarily for the production of plutonium and a reactor designed primarily for the generation of power. Major W. V. Fuidge asked what was the reason for the difference of the control rod distribution between the two reactors. Mr. W. J. Prior asked the author whether he was satisfied that the staff organisation at Calder was correct.

Mr. K. T. Gibbs said that at one stage during the commissioning a considerable quantity of oil had entered the reactor by mistake. The original design had been based on the surmise that no oil must be allowed to enter, but no bad effects appeared to have resulted. Did this mean that, with adequate precautions, the complete embargo on oil could be lifted and the mechanism could be lubricated? Mr. N. V. Worthington asked whether any attempt had been made to keep the inlet temperatures of the reactor up in order to minimise the storage of energy in the graphite.

The author, in reply, said that outside the reactor the maintenance tasks could be awkward, but they were mechanical problems and not nuclear hazards. Inside the reactor the position was reversed. At the first major shut-down they had been able to get into the bottom of the reactor, but in the long run once the total irradiation of the steel had built up, he did not think that would be possible in this type of reactor. Within the main biological shield all maintenance had to be carried out by remote handling, and accessibility depended entirely on the development of remote handling devices. He agreed on the need to give figures on irradiation levels, which the Authority recognised. After the Geneva Conference perhaps more information would be available.

Regarding commissioning time, he said that he would be reluctant to start off a new type of reactor without a similarly careful review to that carried out at Calder. They must look at the mechanical characteristics of their plant before deciding whether to adopt the same routine as at Calder. In principle, there was no difference between plutonium and power reactors. It was mainly a difference in the detail of design and in the way the reactor was run. For instance, he doubted whether the C.E.G.B. stations would drop the return gas temperature as far as at Calder. The plant would be worked between different limits. A plant might be run in a way which reduced its thermal efficiency, but one might be prepared to accept that reduced efficiency if it gave a gain in plutonium. The reason for the difference between the number of control rods was that in the first case they had little operating experience and were anxious to have as few mechanisms installed as possible.

Staffing of Nuclear Stations

As for the staff organisation the only major difference probable between Calder and the C.E.G.B. would be a strengthening on the technical side. As well as the people responsible for direct day-to-day operation, it was necessary to inject a number of people with sufficient interest and background in physics and mathematics to do the considerable amount of nuclear calculation needed to decide whether the reactor was correctly trimmed.

Experience had shown that there was no need to be quite so terrified of the possibility of the entry of oil as some people had been initially. Nevertheless, he would hate to think that they would consider the possibility of using some of these lubricants. The need for strict control in keeping out slight trace elements was as important as ever. The oil in question had been checked and did not carry anything which would cause much trouble.

They could not determine the return inlet temperature on purely graphite considerations, and how far they must go to get a worthwhile return was information which they would be able to build up from future reactors. He would not like to work on gas outlet temperature alone. They needed to know a good deal more about the temperature of the uranium and conditions at the interface. They needed much more information about what happened inside reactors before the control could be simplified.

FARADAY HOUSE ENGINEERING COLLEGE

Extension of Activities

IT was in 1889 that Robert Hammond and Francis Ince founded the Faraday House Engineering College for the training of engineers for the nascent electricity supply industry. The first principal was Hugh Erat Harrison, but his tenure was ended by his early death and he was succeeded by Dr. Alexander Russell, who put the College on a high plane and was a pioneer of the "sandwich" system for which Faraday House has been noted. This system is now fully recognised as one which produces at an earlier stage men able to apply their theoretical knowledge in a practical way.

Dr. Russell, who had been President of the Institution of Electrical Engineers and a Faraday Medallist, died during the last war. The principal is now Mr. G. H. Randolph Martin, who succeeded Dr. W. R. C. Coode-Adams last year.

It has now been decided that the College must widen its scope. Hitherto its main aim has been to train young men as electrical power engineers, some of them becoming leading technologists in the electrical industry. It is anticipated that the College will now include in its curriculum diploma courses in mechanical and physical sciences, and while preserving its close contact with the electrical industry, use its experience to attain similar status in other branches of science and engineering. In the sphere of electrical engineering its courses will embrace light-current subjects. The question of awards, other than the College's own widely-recognised diploma, is to be carefully examined and, if considered necessary, instruction offered in the new programme will take account of these.

Faraday House is an independent establishment which, it is claimed, gives it a flexibility which other colleges may not possess. Above all it marries theory and practice and this foundation will be maintained. To supervise the carrying out of the new policy an influential new board of governors has been formed. It consists of the following:—

Col. B. H. Leeson, C.B.E., T.D., M.I.E.E. (*chairman*), Director, B.E.A.M.A., Past-President, I.E.E.; Mr. F. A. Bell, F.C.A.* (*deputy chairman*); Sir Josiah Eccles, C.B.E., M.M., B.Sc., M.I.C.E., M.I.Mech.E., M.I.E.E., Deputy Chairman, Electricity Council, Past-President, I.E.E.; Sir Vincent de Ferranti, M.C.*, Past-President, I.E.E., Past-President, B.E.A.M.A., Chairman, British National Committee of the World Power Conference; Mr. T. E. Goldup, C.B.E., M.I.E.E., director, Mullard, Ltd., President, I.E.E., member of the Board of Governors, Ministry of Supply School of Electronics, Malvern; Mr. S. E. Goodall, M.Sc.(Eng.), M.I.E.E., chief engineer, W. T. Henley's Telegraph Works Co., Ltd., vice-president, I.E.E., chairman of the Electrical Engineering Section of the Regional Advisory Council for Higher Technological Education, London and Home Counties, member of the Board of Studies in Engineering of the National Council for Technological Awards; Mr. J O. Ince, Companion I.E.E.* (*past chairman*); Mr. J. F. R. Ince, M.I.E.E.,* John I. Thornycroft & Co., Ltd.; Sir Frederick James, European director, Tata, Ltd., largely concerned with Tata Scholarships and with a general interest in Indian students in the United Kingdom; Sir Hamish Maclaren, K.B.E., chief electrical engineer, Admiralty, vice-president, I.E.E.; Mr. Arthur D. Merriman, G.C., O.B.E., D.L., M.A., D.Sc., C.I.E.Mech.E., past-director, Institution of Metallurgists, member of the governing body of the National Council for Technological Awards; Sir Gordon Radley, K.C.B., C.B.E., M.I.E.E., Director-General, G.P.O., past-president, I.E.E., Faraday Medallist, 1936; and Mr. L. W. Smith,* past-chairman, B.E.A.M.A.

Ex Officio.—President, Faraday House Old Students' Association (Mr. T. A. D. Honnor, M.I.E.E.); senior vice-president, Faraday House O.S.A. (Mr. J. W. Bailey, M.I.E.E.); and the Principal (Mr. G. H. Randolph Martin, H.N.D., A.M.I.E.E., M.Brit.I.R.E., M.I.Mar.E.).

* Former members of the Board.

Trade with Canada

THE Dollar Export Council's delegation to Canada left London yesterday, and in the course of their stay in Canada, which lasts until 21st May, they will visit Ottawa, the St. Lawrence Seaway, Montreal, Halifax, Quebec, Toronto, Winnipeg, Regina, Edmonton, Calgary, Victoria and Vancouver. Meetings have been arranged with the Regional Committees of the Dollar Sterling Trade Council, with the Canadian Association of British Manufacturers and Agencies and with the U.K. Trade Commissioners.

The delegation, whose visit forms part of the follow-up measures to the Canadian Trade Mission which visited this country in the autumn, is led by Sir William Rootes (chairman of the D.E.C.). The other members are: Sir Charles Hambro (chairman, D.E.C.'s Financial Advisory Panel), Sir Edward Herbert (chairman, D.E.C. North American Committee), Sir Norman Kipping (director general, F.B.I.), Mr. J. V. Morrison (representative, Northern Ireland Development Council), Lord Polwarth (chairman, Scottish Council of Development (Industry)), Lord Riverdale (president, Association of British Chambers of Commerce), Sir Vincent Tewson (Trades Union Congress), Mr. Henry F. Tiarks (member, D.E.C.), Mr. E. D. O'Brien (hon. public relations adviser) and Mr. P. S. Young (chief executive, D.E.C.).

The "Report of the Canadian Trade Mission to Britain, 21st November-18th December, 1957," published last week, records the objects of the Mission and contains a summary of its activities, a factual account of its observations and impressions, and a synopsis of its recommendations. Copies are obtainable free of charge from the Dollar Export Council, 21, Tothill Street, London, S.W.1.

In their remarks on the electrical industry the Mission draw attention to the great deal of effort being devoted to research and development and note an increasing readiness to adapt designs to meet overseas requirements. It is also suggested that Canadian manufacturers might well advance their own interests as well as make a significant contribution to British exports by compiling catalogues of components required from external sources. The importance is stressed of British manufacturers making their products well known to Canadian engineers so that specifications are not written in a manner that precludes supply from Britain. Although deliveries to Canada have improved in recent years, the Mission noted that British suppliers were prejudiced by the speedy development of Canadian plans and projects. It was felt that Canadian buyers should in every way possible be encouraged to institute earlier planning and so allow British suppliers more time to tender. The special opportunity for the supply of the major items of thermal power station plant is stated to be realised by British manufacturers, who are, in the main, closely in touch with the Canadian market in which they hold a competitive position. The Mission commend to British industry in general the "outstandingly successful" arrangement whereby four electrical firms have merged into a consortia for the purposes of trade with Canada. British consulting engineers, the Mission consider, can also make a significant contribution by association with firms of Canadian consultants.

Electricity Generation in London*

By H. V. PUGH, M.I.Mech.E., M.I.E.E.

IN a paper on "The Supply of Electricity in the London Area," presented at the Institution of Electrical Engineers in 1954, Mr. D. B. Irving, then deputy and now chairman of the London Electricity Board, confined himself largely to distribution. The present paper presents a complementary survey covering the generation of electricity in the London Area during the first nine years of nationalisation to the end of 1956.

The total installed capacity of turbo-alternators taken over in 1948 was 2,698 MW in 30 steam stations. Of the sets in commission, 74 out of a total of 146 were under 10 MW and 90 were over 20 years old; the 105 MW set at Battersea was still the largest in this country. Of 328 boilers, 187 were over 20 years old and several small units were over 40 years. The majority of the boilers had chain-grate stokers; pulverised fuel firing had not been installed since 1931 and previous to that year, with the exception of Barking "A," only in a few experimental cases. Retort stokers were used on nine 250 to 300 klb/hr (Fulham) and eight 260 klb/hr (Battersea) boilers. Steam pressure and final temperature had reached 650 lb/sq in and 850 deg F, except at Battersea and Taylor's Lane, where boilers installed at approximately the beginning of the war operated at 1,400 lb/sq in and 960 deg F.

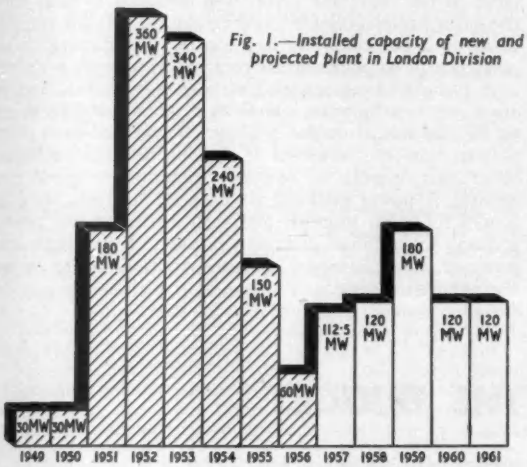


Fig. 1.—Installed capacity of new and projected plant in London Division

New Plant

The London Division took over the responsibility for new work amounting to 1,162 MW, which had previously been arranged between the former Central Electricity Board and authorised undertakings of which about 700 MW was engineered by consultants. For much of this plant steam conditions had been stepped up to 900 klb/hr and 900 deg F at the turbine stop valve, while at Battersea the use of the higher pressure and temperature was extended. Boiler sizes were increased, the majority being rated at 300 klb/hr and above, at which pulverised fuel firing became necessary. The only exception was the new Bankside station, which burned bunker-grade fuel oil.

Since 1st April, 1948, the Central Electricity Board's original programme has been augmented and the London Division has been responsible for the installation of 40 turbo-alternators with a total capacity of 2,048·5 MW, of which 29 were in service before the end of 1956, and 65 boilers with a total evaporative capacity of 21,590 klb/hr, of which 54 were commissioned in the same period. The highest figure of 360 MW commissioned in 1952 (Fig. 1) represented 25 per cent of the total capacity installed by all Divisions in that year. In the three years 1952, 1953 and 1954 nearly one million kW of new plant was completed and commissioned in London alone.

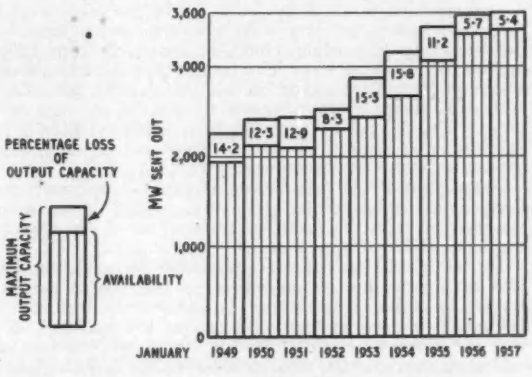
There has been steady improvement in the reduction of plant outage during the winter. In the last two years the plant out of commission has been due largely to breakdown or repairs at manufacturers' works (Fig. 2).

The 275 kV grid will make available in the south power generated in the new large generating stations on or near the coalfields. This will result in a transfer of much of the southern base load to these stations with their lower fuel costs, enabling most of the plant in London to be shut down each night. To meet the rising demand each morning during the winter, plant will have to be brought on load at an estimated rate of 2,000 MW per hour. A 60 MW set operating at 900 lb/sq in and 900 deg F, can safely be run up to speed and fully loaded in 30 min.

Fuel Supplies

In 1956 nearly 7 million tons of fuel was delivered by sea to the London stations, of which nearly 192,000 tons was stored at Dagenham Dock to allow for delays in bad weather and 202,000 tons was withdrawn. Owing to the limited coal storage capacity at London stations a contract made several years ago with Samuel Williams & Son, Ltd., provided for storage for London stations up to 300,000 tons. No fewer than 38 colliers were employed in 1956 in bringing coal to London stations; of these 27 were owned by the Authority, the remainder being chartered vessels. The upriver colliers, mostly of nearly 2,500 tons,

Fig. 2.—Maximum output capacity in London Division



* Summary by the author of a paper, "The Generation of Electricity in the London Area," presented before the Supply Section of the Institution of Electrical Engineers yesterday (Thursday). Mr. Pugh, who was formerly controller of the London Division of the Central Electricity Authority, is now chairman of the Eastern Electricity Board.

are built to pass under ten road and five railway bridges crossing the Thames between the Pool of London and Fulham. Several 4,500 ton vessels have been built to carry coal to the down-river stations.

The extensive cable system in London required a charging reactive power in 1948 of 400 MVAr; by 1954 this had increased to 570 MVAr and by 1960 it will probably reach 700 MVAr. This heavy charging reactive power was counteracted to some extent by using reactors on certain of the longer feeders and by a 33 MVA synchronous motor-driven frequency changer at Deptford West station now used for backing-up a 25 c/s supply normally given from Deptford East to British Railways.

Additions have been made to the transmission system to deal with the output from new plant, to provide new points of supply to the London Area Board and to add new connections to the grid system outside London. Except for the Brunswick Wharf-Brimsdown 132 kV overhead line the extensions have been by underground cable. This overhead line, of 12·5 miles, traverses the industrial East End, has 74 towers, only seven of which are of the straight line type and all but two are fitted with extensions. The use of 132 kV cable is now normal for extensions and considerable lengths of cable will be used in linking the London system to the 275 kV grid points at Tilbury, Elstree, Iver, West Weybridge and, later, Northfleet. This will enable the night load of London to be carried by new stations in the East Midlands coalfields and, in effect, reverse the pattern of recent years, during which the output from the London stations had been used only up to about 57 per cent in London, about 3 per cent by the railways, the remainder being supplied to the main grid system. Existing transmission and Area Board switchgear have been modified where possible to raise the breaking capacity and, since 1952, all new 132 kV gear has had a breaking capacity of 3,500 MVA.

Since about 1935 power station stacks have been built at least 2½ times the height of the adjoining station building. Many of the older stations had numerous short stacks, each boiler usually having a separate chimney, smoke and grit emission from these being lessened by using high-grade fuel and by steaming the boilers below their rated capacities. All new boilers are equipped with mechanical dust-arresting plant or electrostatic precipitators, or both, resulting in a grit emission as low as 0·1 gm/cu ft.

At Battersea, the sulphur content of the selected coal fired is limited by flue-gas washing to 1 per cent or less, and efficiency of sulphur removal of 85 to 90 per cent is achieved, but at an all-in cost of about 10s per ton of coal.

The Bankside flue-gas washing plant, similar in principle to the Battersea plant, was designed to deal with the gases produced by burning oil with a sulphur content of up to 4 per cent, and has consistently maintained an efficiency of sulphur dioxide removal of over 95 per cent.

A basic training school has been established, and in 1956 over 200 boys in school were interviewed to select 60 for the annual intake. They are required to register as part-time day students at various technical colleges. After two months at Bankside apprentices spend two months at power stations, go back to the basic training school for eight months, and then return to the power stations to continue training. Student apprentices are, however, given six months in manufacturers' works during their apprenticeship.

DEBATE ON THE BUDGET

IN his Budget speech, Mr. Heathcoat Amory, the Chancellor of the Exchequer, said that when the House passed the Nationalised Industries Loans Act last month he promised that he would make substantive proposals in the Budget either to abandon or continue the practice of using the Exchequer as the source of capital finance for the electricity, gas, transport and airways undertakings. The reasons which led the Government to adopt the present system in 1956 still held good in the market conditions of to-day and he therefore proposed to continue the practice, at least for another year. "It is still the case that these industries cannot in practice borrow on their own credit," he said, but the matter would be reviewed again in next year's Budget.

Next day the Chancellor tabled a motion to extend the operation of Section 42 of the Finance Act, 1956, from 31st August next (to which it was extended by the Nationalised Industries Loans Act) to 31st August, 1959, and to increase the aggregate sum which could be advanced from £700 million to £1,050 million. This means that there could be advances up to £370 million in the coming year, compared with the average of £350 million allowed for the past two years. The House has already been informed that it is expected that almost all of the £700 million originally allowed will have been borrowed by 31st August next.

From all sides of the House members welcomed the Chancellor's proposals for the rationalisation of purchase tax and the reduction from 60 per cent to 30 per cent in the tax on electrical appliances.

Mr. Gaitskell praised the Chancellor for rejecting the idea of a general sales tax which, he said, would involve increasing or imposing taxation on many necessities of life in order to reduce taxation on luxuries. He was glad, too, that the Chancellor had defended the present method of collecting purchase tax through about 60,000 manufacturers and wholesalers; all experience showed that an attempt to collect it at the retail stage would be extremely difficult, if not impossible.

The Opposition, he said, opposed the amalgamation of the two rates of profits tax because this would inevitably encourage the payment of larger dividends and have a deterrent effect on the accumulation of company reserves and the promotion of company saving.

Mr. Eric Johnson was sorry that the hire-purchase restrictions had to be maintained. Such transactions accounted for only about 3 per cent of total consumer expenditure.

Mr. Marcus Lipton said that because of Government policy British industry was producing no more to-day than in the autumn of 1955. Labour and capital were being wasted and our record compared most unfavourably with that of Germany, France and many other Continental countries.

The first of the housewives to welcome the reduction in tax on electrical appliances was Mrs. Harriet Slater. "I have always argued that the person who needs the electric cleaner, the electric washer and refrigerator is the woman who has a family to look after," she said. "That means the working-class woman in particular, who has to do all the jobs herself and often goes out to work as well. The refrigerator is not a luxury; it is very much a necessity, particularly to women who go out to work."

Sir John Barlow supported the Chancellor's view that the time had not yet come "to release the brakes on the economy." We could not buy our way out of a recession, he said, but we should work ourselves out of one if it occurred.

Sir David Eccles told the House that the Government would bring forward a new Bill to amend the Distribution

of Industry Act to give wider powers for the Treasury to provide financial assistance in starting new industries in areas where there was heavy and persistent local unemployment. He hoped the Bill would get a swift passage. He spoke with enthusiasm of the Montreal conference of eleven Commonwealth nations to be held in September to promote trade.

Mr. D. Houghton congratulated the Chancellor of the Exchequer on his decision to relax the rules applied to Schedule E assessments so that professional men would be able to claim deductions in respect of subscriptions to professional societies with activities relating to their work and for certain statutory registration fees.

On the depreciation of plant and machinery, Mr. Geoffrey Hirst said that British firms should be placed in a position in which they would lose no advantage from getting up-to-date plant, even if it meant some loss of tax.

For the Liberals, Mr. J. Grimond said the Chancellor was wrong in deciding to continue financing the nationalised industries out of the Treasury. The gas and electricity industries should be made to raise their money on the market as was recommended by the Herbert Committee.

Purchase Tax Reductions

AS announced by the Chancellor of the Exchequer in his Budget statement, purchase tax was reduced on 16th April from 60 to 30 per cent on a wide range of domestic electrical appliances. Apart from electric cookers, boiling rings, grillers, hot plates and wash boilers, which continue to be exempt, all domestic electrical appliances now bear tax at the single rate of 30 per cent.

The reductions in tax apply to "goods delivered by registered manufacturers and wholesalers, or imported by unregistered persons, from 16th April, 1958." The appliances on which the tax has been halved are those in Group 12b(i) and include fires, washing machines, vacuum cleaners and refrigerators. Other appliances in Group 12, such as kettles, blankets and irons, and appliances in other Groups, such as lamps and lighting fittings, continue to bear tax at 30 per cent. Although oil heaters have now been brought into line with gas and electric fires and convectors and bear tax at 30 per cent, other domestic appliances not operated by gas or electricity continue to bear tax at the lower rate of 15 per cent. Details of these and other changes are given in Notice 78N issued by H.M. Customs and Excise, King's Beam House, Mark Lane, E.C.3.

Speaking on behalf of the Electrical Development Association, Mr. J. I. Bernard, the director and secretary, said he welcomed "the Chancellor's substantial reduction in the purchase tax on so many domestic electric appliances which will make such a difference in saving time and labour to working housewives all over the country. It has always been this Association's contention that these appliances are the housewives' tools and should never have been regarded as luxuries. It is particularly gratifying that the Chancellor has halved the tax on domestic refrigerators which not only keep the food fresh but save the housewife so much time and money in her shopping."

Mr. Ivor Williams, manager of the Domestic Equipment Department of the General Electric Co., Ltd., said: "The reduction on refrigerators is bound to help an industry which has been very sadly penalised in the past few years by the heavy rate of tax. It will help us perhaps in more directions than the home market because the expansion in production will give a boost to the trade and enable us to launch out in competitive markets abroad."

Effect on Retailers

Although the reductions in purchase tax apply only to goods delivered from 16th April, most retailers have, as on previous occasions, also marked down the prices of existing stocks. Where these were large they will, of course, have to stand a heavy loss. But the natural tendency is for retailers to delay restocking after Christmas until any changes in the rates of purchase tax have been announced in the Budget. Because this causes difficulties for manufacturers, arrangements have existed for some years whereby a retailer can ask a registered supplier to deliver goods on consignment account during a period of three or four months prior to the Budget. The retailer has to pay the normal trade price of the goods but is liable for the purchase tax only when a sale is made. Seven days after the Budget any goods still held by the retailer must be invoiced to him at the then ruling rate of tax. Until this date the goods not sold remain the property of the registered supplier and must be kept apart from the retailer's stocks of similar goods, and also available for inspection by H.M. Customs and Excise. These arrangements appear to have worked satisfactorily and they may be expected to operate also in the case of an Autumn Budget should there be one.

Changes in Purchase Tax on the Principal Domestic Electrical Appliances, 1945-58

	1945 Oct.	1946 April	1947* April	1947* June	1947 Nov.	1948 April	1950 Jan.	1951 April	1953 April	1954 Jan.	1955 Oct.	1957 April	1958 April
	%	%	%	%	%	%	%	%	%	%	%	%	%
Boiling Rings, Grillers, Hot Plates ...	Nil	Nil	66⅔	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Cookers	Nil	Nil	66⅔	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Kettles	33⅓	Nil	66⅔	Nil	Nil	Nil	Nil	Nil	Nil	Nil	30	30	30
Refrigerators	Nil	Nil	66⅔	Nil	Nil	33⅓	33⅓	66⅔	50	50	50	60	30
Immersion Heaters	Nil	Nil	66⅔	66⅔	75	100	100	100	75	50	60	60	30
Storage Water Heaters	Nil	Nil	66⅔	66⅔	75	100	66⅔	66⅔	50	50	60	60	30
Wash Boilers...	Nil	Nil	66⅔	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Washing Machines	33⅓	33⅓	66⅔	33⅓	50	33⅓	33⅓	66⅔	50	50	60	60	30
Smoothing Irons, Pressing Irons	33⅓	33⅓	66⅔	Nil	Nil	Nil	Nil	Nil	Nil	Nil	30	30	30
Lighting Fittings and Lamps	33⅓	33⅓	66⅔	33⅓	50	33⅓	33⅓	33⅓	25	25	30	30	30
Vacuum Cleaners	33⅓	33⅓	66⅔	33⅓	50	33⅓	33⅓	66⅔	50	50	60	60	30
Space Heaters (Fires, Radiators, Convectors)	Nil	Nil	66⅔	66⅔	75	100	100	100	75	50	60	60	30
Cooking appliances that can be used as space heaters	Nil	Nil	66⅔	66⅔	75	100	100	100	75	50	60	60	30

* The rates proposed in the April, 1947, Budget were amended in debate and the new rates came into effect in June.

COMPUTER APPLICATIONS

Discussion on I.E.E. Papers

THE three papers which were presented to a joint meeting of the Measurement and Control Section with the Utilisation Section of the Institution of Electrical Engineers on 15th April were summarised in our last issue. They were "A Train Performance Computer," by Professor E. Bradshaw, M. Wagstaff and F. Cooke; "The Simulation of Distributed Parameter Systems with Particular Reference to Process Control Problems," by J. F. Meredith and E. A. Freeman; and "A Magnetic-Drum Store for Analogue Computing," by J. L. Douce and J. C. West.

Mr. J. A. Broughall, discussing the first paper, said that the British Railways modernisation plan had made it obvious that some kind of computer would be needed and the Commission had had to choose between a digital computer, which was fairly expensive, and the more modest analogue computer. He thought that the accuracy of plus or minus 1½ per cent which Professor Bradshaw had claimed for his computer was not accurate enough because on a trip to Newcastle it represented four to six minutes. This was important at modern train speeds.

Given the modifications which Professor Bradshaw had suggested, they might have a very useful tool for the training of drivers. In view of the importance of driving trains as fast as they could go with safety and efficiency—not necessarily the same things—this might be a useful tool in driving schools. The paper showed that the British Transport Commission were very much alive to the importance of supporting the universities and development of this kind by financial grants.

Noise Problem

Mr. G. R. Higgs, speaking from the point of view of a project design office of a manufacturer of electrical equipment, suggested that the estimate of a ten-to-one saving in time given by Professor Bradshaw was conservative. The Mark II model with which he was familiar was so noisy that it could have no place in a general engineering office and in his organisation it would have a room to itself. Moreover, the amount of use to which it could be put in such an organisation was not extensive and, with office space at a premium, it was not economic for it to occupy the space which could be used for an engineer's desk. In addition, by providing a separate room they provided a dust-free atmosphere.

Mr. S. D. Van Dorp referred to the automatic curve followers and asked what advantage there was in the graphite conducting track.

Mr. M. Whitehead said that as one engaged in the design and manufacture of electricity meters he was delighted that another use had been found for them. The authors claimed an accuracy for them of plus or minus ½ per cent, a claim which he himself would not have made. It sounded very good for a standard meter, but, in fact, it departed from standard in two respects—the calibration device and current coil winding. The self-heating error which the authors said was the only error worth reducing could, in fact, be reduced to negligible quantities.

Dr. J. H. Westcott said that one of the sad things about this art and its development was that they were perpetually dogged by a lack of suitable components, and this was reflected in the fact that ordinary computers were not as cheap as they might be.

Mr. F. J. U. Ritson, discussing the second paper, said it was worth considering the objections to having a lot of apparatus in an analogue computer. The first was the maintenance problem and the second was the testing problem. It was as easy to make mistakes with an analogue computer as with any other calculating device. The machine was subject to errors when being set up and the operator was subject to errors in setting it up. The difficulties increased with complexity of the machine, and there was everything to be said for keeping machinery simple. In this respect the method described by the authors was very useful.

Mr. J. K. Webb, discussing the third paper, said there was now a design which floated the magnetic heads on a cushion of air so that they were held at a constant distance from the drum in spite of any eccentricity. They could be held with a very small gap—0·0003in.

Professor Bradshaw, in reply, said he appreciated that an accuracy of ±1½ per cent might mean a few minutes in a run to Newcastle, but they were using information about track and stock which was not always known to this degree of accuracy. The Mark III machine overcame the noise problem.

E.A.W. Conference

THE annual conference of the Electrical Association for Women will be held next week at the Music Hall and Assembly Rooms, Edinburgh. The theme is "Electricity for Everywoman," and the many aspects will be presented in formal sessions, in an exhibition, and in a dramatised version.

Delegates will register on Monday, and at the opening session on Tuesday morning the speakers will be the Viscountess Kilmuir (president), Mr. I. A. Johnson-Gilbert (Lord Provost of Edinburgh), Mr. J. S. Pickles (chairman, South of Scotland Electricity Board), Mrs. A. F. Allan (chairman, E.A.W. Scottish Council) and Mrs. A. Vos-Warnecke (president, Dutch E.A.W.). Following the addresses a dramatised version of the E.A.W. campaign, "Electricity for Everywoman," will be given by the staff of the South of Scotland Electricity Board. The annual general meeting will be held in the afternoon, followed by the National Executive Committee meeting, and in the evening there will be an official reception and dance.

On Wednesday morning there will be a golf competition and an electrical "At Home" in the George Street Service Centre, followed by the annual luncheon. The National Advisory Council's meeting will be held in the afternoon and the Scottish E.A.W. Branches have arranged a party in the evening.

Another electrical "At Home" will be held at the George Street Service Centre on Thursday morning, and in the afternoon a number of visits have been arranged, including visits to the B.N.E. factory, Newarthill, and the Bruce Peebles, Ferranti and Carron factories. A post-conference tour has been arranged for Friday by the South of Scotland Electricity Board.

Universal Decimal Classification

THE trilingual edition of the Universal Decimal Classification which is to rank henceforth as the international standard abridged edition of the U.D.C., has just been published in this country, price 6 guineas, by the British Standards Institution, 2, Park Street, London, W.1.

This 516-page publication is in German, English and French, and is to be known as B.S. 1000B : 1958. It is intended primarily for classifiers in all branches of documentation, library and information work.

NEW BOOKS

Synthesis of Passive Networks. By Ernst A. Guillemin. Pp. 741; figs. Chapman & Hall, Ltd., 37, Essex Street, London, W.C.2. Price 120s.

Once again Professor Ernst A. Guillemin has written a classic of electrical network theory. His "Mathematics of Circuit Analysis" and "Introductory Circuit Theory" are well known as forming the basis of modern methods of network analysis. The present volume gives the foundation of network synthesis—the theory and methods appropriate to the realisation and approximation problems.

The analysis of the performance of any electrical circuit is always possible, in theory at any rate, but it is not always possible to derive a circuit from any given transfer function or similar specification of performance. The first chapter is devoted to physical considerations, and methods of testing for the positive real character of functions.

Two-element-kind networks—LC, RL, and RC networks—form an introduction to synthesis procedures. The properties of the driving point impedances of these networks are outlined, and the synthesis of networks from these impedances achieved by partial-fraction expansions and Foster-like realisations. An interesting chapter upon equivalent and reciprocal networks introduces the properties of two terminal-pair networks, and the synthesis of such networks when they are loss-less.

The latter half of the book covers the synthesis of RLC driving point impedances and transfer functions. Many methods are described, mostly named after their originators—the Brune method, Darlington's synthesis, the Bott and Duffin procedure, and the Miyota method being typical examples. The formulation of transfer functions from data given in graphical form, and a chapter on "Time Domain Synthesis" conclude the book.

Every chapter ends with a set of practical problems which require the methods described for their solution. The book is written in a clear and unambiguous style, but demands a good working knowledge of mathematics and modern network analysis techniques from its readers.—K.W.W.

Electricity and Magnetism. By J. Newton, B.Sc., A.Inst.P., A.M.I.E.E. Pp. 613; figs. 361. Sir Isaac Pitman & Sons, Ltd., Parker Street, Kingsway, London, W.C.2. Price 25s.

This book, written by the senior lecturer in physics at Northampton College of Advanced Technology (late Polytechnic), covers the Electricity and Magnetism syllabuses of the G.C.E. (Advanced Level), Intermediate B.Sc. and O.N.C. in Applied Physics. It is somewhat difficult to review a textbook of this character; one is apt to set it against nostalgic memories of the text from which one obtained one's own early instruction, and the present work rather invites such comparisons by eschewing all obvious novelty of presentation. The traditional c.g.s. system of units is employed, in order to comply with the requirements of the examining bodies: the M.K.S. system is described only in brief outline in the chapter on units and dimensions.

The general development follows the sequence: the electric current; power; resistance and d.c. measurements; electrolysis; electromagnetism; electrodynamics and electromagnetic induction; alternating current and electrical machines; capacitance; electrostatic theory; magnetism, including the magnetic properties of materials and magnetometry; and thermoelectricity. These, together with the chapter on units and dimensions mentioned above, complete the main sequence of the book. The numerous line text figures have been drawn for this work, and one is spared the catalogue illustrations of long obsolete instruments. References to such topics as the construction of commercial capacitors, wire-wound and carbon resistors and a chapter on photocells, valves and cathode-ray tubes indicate the fairly practical outlook.

There is also a chapter on the physics of the atom, which accounts for the only half-tone illustrations in the book. This inevitably hasty summary of the discovery of the electron, Millikan's determination of e, the mass spectrograph, radioactivity and even X-ray diffraction is a traditional feature, justified by the exigencies of the examination syllabus, though it is perhaps doubtful whether it has a proper place in a textbook of electricity and magnetism, or whether the student is likely to profit greatly from such a condensed account.

There are numerous examples, mainly taken from papers set by the examining bodies, at the ends of the chapters, together with answers at the end of the book. It should prove useful to large numbers of students.—P.L.D.

Transistor A.F. Amplifiers. By D. D. Jones, M.Sc., D.I.C., and R. A. Hilbourne, B.Sc. Published for *Wireless World* by Iliffe & Sons, Ltd., Dorset House, Stamford Street, London, S.E.1. Pp. 152; figs. 94. Price 21s.

This book, as the authors mention in their foreword, is based largely on work done to supply customers with practical design information and this background has undoubtedly resulted in a treatment which will be greatly appreciated by radio and electronic engineers. An immense amount of information of real value to circuit designers is contained in the book.

Starting straight away with an eye to what the user requires, the book eschews excursions into solid state physics and deals first with the electrical characteristics of transistors. It goes on in the succeeding chapters to the treatment of general design considerations, first for small signal a.f. amplifiers and then for power amplifiers. Particular points dealt with here are coupling methods, bias stabilisation, noise, volume and tone control, various causes of distortion, thermal stability and negative feedback.

The chapters that follow show how the foregoing considerations are applied to the design of a number of practical circuits which are described in great detail. Pre-amplifiers, and Class "A" and "B" amplifiers with output stages ranging from 250 mW to 20 W are included, all component values and transformer winding data being specified. Discussions on complementary symmetry, power supplies and amplifier applications occupy the concluding chapters.

A particular feature of the book is the lucidity of the writing and in this the authors are to be congratulated on not only knowing their subject thoroughly, but also having the ability to present it so as to be readily comprehensible to others. There is a real need for books of this kind which treat the essentials of their subject really thoroughly and yet avoid what might be described as academic window-dressing and it is to be hoped that the authors will in due course tackle other aspects of transistor circuitry in the same excellent manner.—B.R.B.

INDUSTRIAL NEWS

Finance for Capital Goods Exports

In the course of the debate on the Budget last week the President of the Board of Trade announced an extension of the scope of the Export Credits Guarantee Department's guarantees to banks. The guarantees, at present limited to capital goods of over £250,000 in value, will in future be available for appropriate capital goods of £100,000 value and over, provided that the credit period is more than three years: and the guarantees will cover 90 per cent of the credit, in place of the present 85 per cent. Contracts to which these guarantees are related must satisfy the E.C.G.D.'s normal insurance principles.

Since the introduction of the guarantees to banks in 1954 the E.C.G.D. has given such guarantees to a total value of £84·7 million. In the financial year just ended guarantees to a value of £29·1 million have been given, compared with £22·9 million in the previous financial year.

Proposed Merger of Cable Companies

The boards of W. T. Henley's Telegraph Works Co., Ltd., and Johnson & Phillips, Ltd., announce that conversations are taking place between them with a view to examining a basis upon which the businesses of the two companies might be merged. When a more definite stage has been reached a further communication will be made.

New E.D.A. Publications

Completely revised editions, with new illustrations, of two E.D.A. publications, "Electric Kitchen Planning" (E.D.A. 1715/RV) and "Cooking the Electric Way" (E.D.A. 296 E/RV), are now available.

The 32-page illustrated brochure, "Electric Kitchen Planning," contains a wealth of information and guidance not only on the design of kitchens in new houses and flats, but also on the improvement of existing kitchens either as a whole, or in instalments. Photographs and diagrams show suggested arrangements of the various components of a domestic kitchen. The brochure, which is intended for distribution to architects, builders and those buying a new house or having one built, contains sections on order in the kitchen, the problem of the large kitchen, dining-kitchen plans, the minimum kitchen, food storage, refrigerators, food preparation space, ventilation, washing up, hot water supply, home laundry, and kitchen lighting including the use of fluorescent lamps.

The second publication, "Cooking the Electric Way," is a 4-page folder which outlines the construction and use of the electric cooker, and is mainly directed to those to whom electric cooking is new. Included are notes on oven thermostat settings for cake and pastry baking, a composite diagram illustrating the special features available on the various makes of cookers, and references to the auto timer oven control and radiant boiling plates, points not included in the previous edition. Copies of these publications are obtainable from Electricity Service Centres or from the British Electrical Development Association, 2, Savoy Hill, London, W.C.2.

Off-Peak Development Conferences

Members of the Electrical Contractors' Association and the South Wales Electricity Board are holding a joint conference and dinner at the Seabank Hotel, Porthcawl, on 6th May, for which tickets are £1 each inclusive of meals. The theme of the conference will be "Off-Peak Development." Mr. R. B. Hellard, Dip.Arch., A.R.I.B.A., A.I.Arb., London, who has made a special study of heating costs, and Mr. E. W. Faithfull, a member of the Board's staff, who has had considerable experience in the design and installation of electric floor heating and night storage heating systems, will give papers.

On the following day the Board has arranged a conference for architects at the Seabank Hotel, Porthcawl, when electrical thermal storage space heating will again be discussed and papers will be presented by Messrs. Faithfull and Hellard.

E. K. Cole and Ferranti

Due to a new policy of concentration of sales effort by the Domestic Appliance Department of Ferranti, Ltd., in promoting the all-electric house, the company will relinquish the manufacture, marketing and servicing of some models in its present range of domestic heating appliances. These appliances are to be manufactured in future by E. K. Cole, Ltd. Mr. Basil Z. de Ferranti, director and head of the company's Domestic Appliance Department, has announced that the change will take effect from 1st June. Ferranti will continue to make the "Fridge-Heater" and electric panel fires. The domestic heating appliances that E. K. Cole, Ltd., will manufacture, market and service under their own name include the "Firestreak" wall fire, "Mistral" convector, "Flamera" coal fire, "Victor" range of lightweight portables and bathroom fires. Ferranti, Ltd., will continue service facilities on all heating appliances bearing the company's name. Inquiries after 1st June should be sent to E. K. Cole, Ltd., Vigo Street, London, W.1.

All-Electric Housing Estate

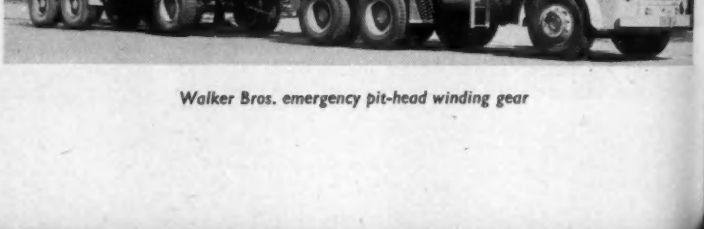
An all-electric housing estate at Poulton, near Blackpool, was officially opened on 16th April by Mr. Basil de Ferranti, a director of Ferranti, Ltd. The Poulton estate will consist of about 70 all-electric houses. They will be two- and three-bedroomed bungalows in the £2,000/£3,000 price range. The Ferranti "Fridge-Heater" will be installed in all the houses and space heating will be provided by electric fires of plain and convector types and also wall-mounted fires in the bathrooms and kitchens, while half of the houses will also have under-floor heating.

Pit-head Emergency Winding Gear

A new diesel-electric transportable winding engine has been developed by Walker Brothers (Wigan), Ltd., together with their associate company, John Wood & Sons, Ltd. This engine is part of a completely self-contained, mobile unit comprising a tractor on which is mounted a diesel-engined generating station, and a trailer bearing the winding engine and control station.

In case of failure of a colliery's winding gear this equipment is capable of raising a maximum unbalanced load of 5 tons from a depth of 3,000ft at a mean rope speed of 12ft/sec.

The diesel-engined generating



Walker Bros. emergency pit-head winding gear

The opening session of the E.D.A. annual conference at Harrogate being addressed by Mr. W. S. Lewis, chairman of E.D.A. From left to right the other E.D.A. officers are Mr. L. Goodman, Mr. W. Robinson, Mr. E. M. Ackery, Mr. J. I. Bernard (director and secretary), Mr. P. Haney and Mr. N. Phillips

station mounted on the Leyland "Hippo" type tractor is powered by a Rolls-Royce C6NFC twin-engined diesel power pack. The generator, driven by the diesel engine through a "Holset" flexible coupling, is manufactured by the B.T.H. Co. and is designed for continuous full load running.

The trailer unit is a rigid 6-wheeled vehicle which carries the main winding equipment. The electric motor is also of B.T.H. manufacture, and the overspeed protection is by Metro-Worral. Limit switches which isolate the power supply and apply the main brakes by means of an electro-pneumatic valve provide overwind protection. A backing-out switch is provided to short circuit the limit switches in the event of an overwind, thus allowing the motor to be restarted in the reverse direction.

Next to the driver's control position is mounted a Ward-Leonard control cubicle containing the exciter set rheostat, generator and motor field discharge resistances, the overload relay, safety contactor, winder motor loco field relay, fuses, shunts, etc., and all the necessary interlocking contactors. The Ward-Leonard controller is chain driven from the driver's hand lever which is mounted in a single slot with the "off" position mechanical interlock.

Portable telephone equipment, and signalling equipment operated by the diesel starting batteries for communication between the winding enginemen and the banksman, is also provided. The driver's control position is in a cabin mounted on the trailer. The interconnecting cables between the diesel generating station and the winder trailer are housed on cable drums on the front end of the trailer chassis.

E.D.A. Sales Conference

Opening the 21st annual conference of the British Electrical Development Association in the Royal Hall, Harrogate, last week, Mr. W. S. Lewis, who is chairman of the Midlands Electricity Board and completes fifty years in the industry next September, referred to the amazing growth of the industry since nationalisation. He said that most of the Boards had doubled their unit sales and could look forward even to doubling them again in the next ten years. He mentioned that there was something of a battle going on to arrive at some standard form of approval of domestic appliances. Those appliances offered to the public by the Boards were, and must be, first-class; the Boards had a reputation for that and were anxious to retain it.

Mr. S. G. Roper, of the Southern Electricity Board, declared that all those engaged in the electricity industry had every reason to be proud of its achievements. By and large the service given was never better than it was to-day, and certainly the cost of electricity had not risen very much —much less than was the case with other commodities.

Gift to Aid Plastics Education

Education and research in the plastics field has been furthered by a donation of £1,000 made by Associated Iliffe Press, Ltd., on behalf of *British Plastics*, the journal which organises the International Plastics Exhibition. A trust has been set up to administer the money with four trustees: Mr. H. V. Potter, Mr. C. C. Last and Mr. N. B. Punfield, all of the British Plastics Federation, and Mr. Claude E. Wallis, chairman and managing director of Associated Iliffe Press, Ltd.

"Schools' Day" at Foster Transformers' Factories

More than fifty boys from grammar schools and technical colleges visited the Wimbledon and Leatherhead factories of Foster Transformers, Ltd., a member of the Lancashire Dynamo Group, on 10th April in order to gain first-hand knowledge of modern industrial life. The boys were welcomed by Mr. M. H. Hammill, managing director, who referred to the important developments taking place in the electrical industry, examples of which were to be seen among work in progress in the Foster factories. Coaches were provided for transport between the two factories and in addition to the tours there were talks and discussions on the organisation of an electrical manufacturing concern and on careers. Apprentices employed at the works acted as guides to the visiting boys and were able to discuss their own experiences in a manufacturing industry.

G.E.C. Export Guide

The April issue of the "Export Guide," produced by the General Electric Co., Ltd., Magnet House, Kingsway, W.C.2, indicates that favourable prospects for British exports continue in a wide range of markets. The latest information available in this country on the export prospects for thirty-six major groups of British manufactured goods in Britain's thirty-four major export markets is given in the Guide, with an indication of present economic conditions in these countries. Current export prospects are good in 16 countries, improving in six cases, deteriorating in seven and bad in five. Changes in trading opportunities for British exporters so far this year include better prospects in Argentina, Ceylon, Kenya and Spain, but the outlook has become less favourable in the Irish Republic and the United States. The usual coloured charts are preceded by a review of British exports in 1957.

Y.E.B. Staff Conferences

The Yorkshire Electricity Board recently held four forty-eight hour staff conferences at Leeds University. These were organised on a departmental basis under the control of the appropriate chief officer, and covered accountancy, secretarial, engineering and commercial subjects. On the first day of the engineering conference Mr. H. Lloyd, assistant chief engineer (operation and maintenance), gave a lecture on "The Safety Rules," and on the second day Mr. H. S. Moody, assistant chief engineer (distribution design—mains), gave a lecture on "Some Aspects of the Design and Construction of Overhead Distribution Lines," following which delegates divided into syndicates to discuss each subject and afterwards the chairmen of the syndicates presented their reports to the whole conference. The theme of the commercial conference was "Publicity" and discussion was centred around the following papers:— "Selling Electricity by Display," by Mr. G. K. Lean, principal assistant

(display centre), and "Advertising in 1958," by Mr. F. A. Mercer and Mr. N. E. Northrop (Tattersall Advertising, Ltd., Harrogate). The accountancy conference was devoted to the theme "Quicker Results" and the following papers were presented:—"Punched Card Accounting—Expenditure," by Mr. W. Dransfield (sub-area accountant, No. 2 (Huddersfield) Sub-Area), "Punched Card Accounting—Income," by Mr. C. Priestley (sub-area accountant, No. 5 (Wakefield) Sub-Area), "Meter Reading," by Mr. A. Dent (organisation and methods officer), and "Some Problems Associated with a New Billing System," by Mr. A. Nolan (sub-area accountant, No. 4 (Leeds) Sub-Area). At the final session of this conference Mr. P. C. Phillips (deputy chief engineer) presented a paper on "The Engineers and Cost Figures."

The secretarial conference was conducted throughout on a sectional basis, each section taking part in demonstrations and discussions on their own particular sphere of work. This conference concluded with a paper on "Secretarial Services for an Engineer," presented by Mr. H. Pickup, sub-area engineer, No. 5 (Wakefield) Sub-Area.

Industrial Art Bursaries Competitions

An exhibition of the winning and commended designs submitted in the Industrial Art Bursaries Competition organised by the Royal Society of Arts in 1957 will be held at the Society's House from 6th to 23rd May. The 1957 competition included sections for domestic electrical appliances and electric light fittings. The exhibition will subsequently be shown at the Carlisle College of Arts; Hull Regional College of Arts and Crafts; High Wycombe College of Further Education; Manchester Regional College of Art; Newcastle-under-Lyme School of Arts and Crafts; and Stoke-on-Trent College of Art.

Post Office Educational Schemes

A day off, with pay, for scientific and technical education, a scheme hitherto limited to juveniles, has been extended to staff up to the age of forty in the Post Office Engineering Department. An agreement to this effect, as part of a large-scale expansion of educational opportunities, has been made between the Post Office and the Engineering Staff Side of the Departmental Whitley Council, consisting of the Post Office Engineering Union, the Society of Telecommunication Engineers and the Society of Technical Civil Servants.

It will take some time to put the scheme into full operation, when it is estimated that about 10,000 employees may take advantage of it. The scheme will cover City and Guilds grouped courses, Ordinary National Certificate, Higher National Certificate, Hives Award (Diploma of Technology), university degree (engineering, mathematics and applied physics) and miscellaneous technical subjects.

The Post Office proposes to make ten awards available each year for approved four-year courses for degree, Hives Award (Diploma of Technology) or, exceptionally, for Higher National Diploma study. The Department will pay all college fees and grant special leave for six monthly periods of full-time study. A maintenance allowance equal to the student's wages or salary will be paid. The other six months in the year will be spent on practical training in the Department. Selection will be based on progress reports of students from technical colleges, as well as on paper qualifications, and reports from local supervising officers. Final selection will be by interview.

The Post Office will offer to its engineering staff each year ten university bursaries for technical and scientific studies. The awards will be made by a Selection Board following a written examination. The Post Office will pay the fees for three years and the successful candidates will be given leave without pay but will receive maintenance grants at the level of the Ministry of Education scale. The scheme has arisen from the 1956 White Paper on Technical Education and the Treasury's advice that Government Departments should consider improving their technical training arrangements.

Colour Film on Steam

A new colour film entitled "Steam and Steam Generation" was shown in London last week. It describes in simple terms the properties of steam as well as the application of these properties in the production of electrical power. It shows the way in which steam is generated, ranging from scenes of the elementary production of steam in a flask to its generation at extremely high pressures and temperatures for the operation of turbines. It includes a detailed examination of a scale model of a boiler at Willington power station and a description of the new International Combustion boiler now being constructed at High Marnham power station, which is believed to be the highest capacity boiler under construction anywhere. The film concludes by pointing out the way in which even the present advanced assisted and forced circulation designs will change again to meet supercritical conditions.

The film was produced for International Combustion, Ltd., by Film House Production, Ltd., with the co-operation of the Royal Institution and the Science Museum. The film runs for 30 minutes and copies (either 16 mm or 35 mm) are available free on loan to technical colleges, schools, and other interested organisations. Application should be made either to International Combustion, Ltd., 19, Woburn Place, W.C.1, or to Gaumont-British Scope Film Library, 11, Belgrave Road, S.W.1. If preferred, arrangements can be made for free film shows to be given on the company's own equipment.

A 120 MVA 275/132 kV Hackbridge transformer on its way to site at Fleet, Hants

Free Electricity for Ten Years

In a case at Chatham last week a defendant who pleaded guilty to fraudulently using electricity admitted that he had been doing so since he took over the tenancy of the house in 1948. He was fined £100.

Mr. T. H. Jones, prosecuting, said that when the prepayment meter at the defendant's bungalow was emptied it recorded only a small amount of electricity as having been used, but the money in the meter agreed with the meter reading. On 13th March an engineer from the Electricity Board found that the meter was being by-passed. An investigation disclosed that a cooker, two fires, a radiator, two tubular heaters, eight lights, a drill and a television set were being supplied with electricity which was not recorded. It was estimated that during the quarter January to March 1,184 kWh had been used but only 17 kWh had been recorded and paid for.

Hawick Television Relay

At Hawick, Scotland, a radio and television relay system has recently been completed by Relay Systems (Hawick), Ltd. This installation gives subscribers in Hawick, previously regarded as a poor area for television reception, a choice of B.B.C. and commercial television programmes and two alternative sound broadcast pro-

grammes. All the cables for the system were supplied by British Insulated Callender's Cables, Ltd., and were manufactured in their plastic cables factory at Helsby.

The main feeder from the mast-mounted aerial array sited on a hill outside the town, where good signal strengths were available, to an amplifying and distribution station near the centre of the town, consists of 2,000 yd of helical polythene aluminium-sheathed coaxial cable, over-sheathed with p.v.c., and is about 1in in overall diameter. The erection was carried out in co-operation with British Insulated Callender's Construction Co., Ltd.

The distribution network throughout the town itself has been wired exclusively with B.I.C.C. standard TR8 television relay cables, and this work was carried out by the local company's own staff.

Lighting Design Courses

The Scottish Committee of the British Lighting Council is holding lighting design courses in Dundee, Edinburgh and Glasgow for the staffs of its members. The dates are: Dundee, 28th and 29th April; Edinburgh, 7th, 14th and 21st May; and Glasgow, 6th, 13th and 20th May. The object of the courses is to provide a foundation of practical knowledge for the staffs who are concerned with the promotion of better lighting.

Brook Two Millionth Motor

The two millionth Brook industrial type electric motor has just been completed. A 200 h.p. motor in the larger range, it was part of a consignment of six drip-proof machines for shipment to Mexico. The motors will eventually drive compressors and were ordered through Brook Motors' American subsidiary, the Brook Motor Corporation of Chicago. The first million industrial motors were completed in 46 years; the millionth motor, made in 1950, was retained by the company. The second million has been completed in only seven and a half years.

Schoolboys at South Wales Switchgear Works

Forty boys from grammar schools in Montgomeryshire recently visited the switchgear factory at Blackwood of South Wales Switchgear, Ltd. The company is offering two scholarships each year to suitable applicants from the grammar schools in Montgomeryshire to undertake five years' training at the factory, coupled with part-time training at one of the major technical colleges in South Wales. The scholarship includes lodging allowance assistance and free transport every fortnight during the apprenticeship scheme to Montgomeryshire. The object of the scheme is to make available the opportunity of apprenticeship training to students in rural areas. It has been propagated in conjunction with the Welsh Joint Education Committee and the Director of Education for Montgomeryshire, together with the Youth Employment Office associated with the Ministry of Labour.

Liverpool Welding Exhibition

A selection of resistance welding machines made by Sciaky Electric Welding Machines, Ltd., will be exhibited in conjunction with the Merseyside and North Wales Electricity Board at the Board's Industrial Development Centre, Cleveland Square, Paradise Street, Liverpool, from 12th to 23rd May.

Trade Announcements

Atkins, Robertson & Whiteford, Ltd., Thornliebank, Glasgow, announce their association with A. F. Stoddard & Co., Ltd., carpet manufacturers. Sir Robert A. Maclean, chairman and managing director of Stoddards, has been elected chairman of A. R. W., Ltd. The company will continue to manufacture transformers and electronic instruments as hitherto, and emphasis will be placed on the development of electronic aids in the field of automation.

The Northern Aluminium Co., Ltd., has established a Central Buying Department at its head office at Bush House, Aldwych, London, W.C.2, to co-ordinate purchasing policies within the company and to negotiate for major items of equipment and bulk supplies of material. Mr. D. A. Corbett-Thompson, formerly export sales manager, has been appointed chief purchasing officer. The Buying Departments of the company's three works at Banbury, Birmingham and Rogerstone, Mon., will continue to function.

The new premises at Edgware of **E. H. Jones (Machine Tools), Ltd.,** are now completed. The accommodation consists of a warehouse for used machines, showroom equipped for working demonstrations, and provision has been made for the introduction of a spares service for C.V.A. automatics and dieing presses. The company's London area address is now 48, High Street, Edgware (telephone: Edgware 4488/9).

Grelco, Ltd., Minehead, Somerset, has opened a London office and trade counter at 123a, Gloucester Road, South Kensington, S.W.7 (telephone: Fremantle 3371).

Davis & Timmins, Ltd., are now manufacturing and stocking a comprehensive range of cut thread and rolled thread screws in both brass and steel, ranging from 0-80 ANF up to and including ⅜in UNC with a variety of heads.

Thermega, Ltd., has moved to 37, Thurloe Street, London, S.W.7.

The Manchester offices of the **Dictaphone Co., Ltd.,** are now at Woolwich House, 59-61, Mosley Street (telephone: Manchester Central 9740 and 9746).

N.G.N. Electrical, Ltd., has moved to Avenue Parade, Accrington.

Metal Blanks, Ltd., Tudor Grove, London, E.9, has developed a capacity for the production of printed circuit boards in both large and small quantities.

Annual Holidays

The works of Lindsay & Williams, Ltd., Openshaw Bridge Works, Manchester, 11, will be closed from 24th May to 2nd June inclusive, but a skeleton clerical and warehouse staff will be in attendance to deal with inquiries and inward deliveries.

Change of Name

The Express Winding Co., has changed its name to Express Transformers & Controls, Ltd., in order to better indicate the scope of its activities.

TRADE MARK APPLICATIONS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 2nd May:—

KEMA. No. 760,584. Class 7. Electric mixing machines for foodstuffs and for beverages, coffee mills (machines), electric cutting machines for meat and for bread; and electric mills (machines) for almonds, peanuts, vegetables and for meat.—Naamloze Vennootschap Tot Keuring van Electrotechnische Materialen, Arnhem, Netherlands. Address for service, c/o McKenna & Co., 12, Whitehall, London, S.W.1.

No. 755,356 (design). Class 9. Apparatus for controlling electric motors by means of current control; electric contactors, resistors, switches, relays; and parts.—Square D Co., Detroit, Michigan, U.S.A. Address for service, c/o H. W. Fitzpatrick & Co., 94, Hope Street, Glasgow, C.2.

VACMAID. No. 769,584. Class 9. Electric vacuum cleaning apparatus and parts.—W. Jolly, trading as Domestic Electric Appliances, Belman Buildings, 39, Carrs Lane, Birmingham.

PAKOSOCKET. No. 771,819. Class 9. Electric sockets. PAKOPLUG. No. 771,820. Class 9. Electric plugs.—McMurdo Instrument Co., Ltd., 10, Upper Berkeley Street, London, W.1.

STEREACORDER. No. 772,087. Class 9. Radio, telephonic, television and telegraphic instruments; sound recording and sound reproducing instruments and apparatus; electric and electronic apparatus and instruments; magnetic tapes for use as sound recording media; and sound records.—Multimusic, Ltd., Mellier House, Albemarle Street, London, W.1.

BERCOHM. No. 772,828. Class 9. Vitreous enamelled electric resistances.—British Electric Resistance Co., Ltd., trading also as Berco, Queensway, Enfield, Middx.

RADSTRIP (design). No. 772,965. SO-RAD (design). No. 772,966. Class 9. Radio apparatus and parts.—C. A. Harley, trading as Southern Radio & Electrical Supplies, So-Rad Works, Redlynch, Salisbury, Wilts.

BED-MATE. No. 772,618. Class 10. Electrically-heated blankets.—G. C. Seed, The White House, Bradford Road, Drighlington, Yorks.

NEW ELECTRICAL EQUIPMENT

Fire Extinguisher

A 30 lb dry-powder fire extinguisher (Model 1630) announced by NU-SWIFT, LTD., Elland, Yorkshire, has been specially designed to tackle fires involving hazardous, highly-inflammable liquids, live high-voltage electrical equipment, oil-fired boilers and similar industrial risks. The extinguisher uses dry powder in the form of a fan-shaped, pressure-projected spray and is capable of dealing promptly and efficiently with inflammable liquid fires up to 250 sq ft in area. The powder is non-toxic, non-corrosive, non-abrasive, and, of particular importance where high-voltage arcs are concerned, non-conductive.

Model 1630 contains 30 lb of dry powder, pressurised with eleven ounces of carbon-dioxide capable of expelling the entire contents in 28 seconds at a rate of over 11 lb/sec. The fan-shaped flat spray has an operational range in still air of 25ft, with a broad front of 6ft, and a height of 4ft, respectively.

Radiation Monitor

A transistorised pocket radiation monitor (Type PW 4014) which employs printed wiring is announced by PHILIPS ELECTRICAL, LTD., Century House, Shaftesbury Avenue, London, W.C.2. It is a watertight, fully tropicalised instrument of rugged construction designed for the general survey, location and measurement of radioactivity. It weighs only 1 lb 5 oz and its small dimensions, 6¼in by 4in by 1¾in, enable it to be carried easily in the pocket. A built-in Geiger-Muller tube permits the instrument to be used as a probe for measuring gamma radiation and a separate mica end-window Geiger-Muller tube with a flexible lead can be plugged into the instrument for beta measurements.

Two measuring ranges are incorporated: one for high and the other for low sensitivity. An accurately-balanced, easily-readable meter indicates the radiation intensity. A small earphone can be connected for the audible detection of very low intensities. The power supply is a 3 V flashlight battery or two miniature 1·5 V cells. The all-transistorised circuit has a low drain, so that long battery life is assured.

Philips transistorised pocket radiation monitor

The PW 4014 sells at £47 10s (basic). Accessories include a G-M probe for beta radiation measurement £11 and an earphone £3.

Low Pressure Gauge

A low pressure gauge designed primarily as a draught gauge is announced by APPLEBY & IRELAND, LTD., Kempshott House, Kempshott, Basingstoke.

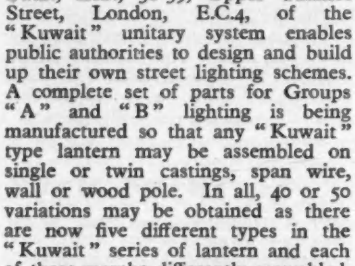
Appleby & Ireland low pressure gauge

Models are available with scales ranging from −1in — +1in water gauge to 9—1,000in w.g. with an accuracy within ±1 per cent full scale deflection. The movement consists of a special capsule connected to a geared mechanism while dials (depending upon the model) range in size from 6in to 10in diameter. The price is £6 7s 6d.

Street Lighting System

The introduction by SIEMENS EDISON SWAN, LTD., 38-39, Upper Thames Street, London, E.C.4, of the "Kuwait" unitary system enables public authorities to design and build up their own street lighting schemes. A complete set of parts for Groups "A" and "B" lighting is being manufactured so that any "Kuwait" type lantern may be assembled on single or twin castings, span wire, wall or wood pole. In all, 40 or 50 variations may be obtained as there are now five different types in the "Kuwait" series of lantern and each of these may be differently assembled. Lanterns are provided in 90 different colours, in aluminium, or alternatively as unpainted kits.

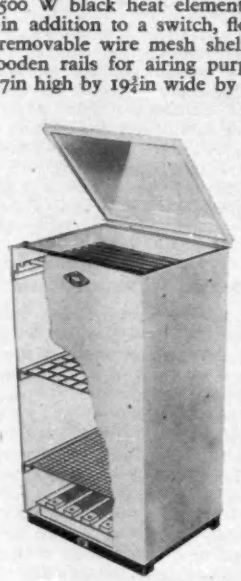
The system has been approved by the Council of Industrial Design and the series embodies a combined reflector and bowl optical system; totally enclosed single bolt bowl fixing; and self-contained control gear on detachable trays. Switch or instant start operation is provided and the lanterns, enclosed by a "Perspex" bowl, take up to eight fluorescent tubes from 2 to 5ft in length.



Typical Siemens "Kuwait" twin street lighting fitting

Drying Cabinet

An electrically heated clothes drying cabinet, the "Taypen," has been introduced by TAYPEN, LTD., 43, Ormond Close, Great Ormond Street, London, W.C.1. It is of sheet steel construction manufactured in three basic parts: base, main body and lid. Two 500 W black heat elements are fitted in addition to a switch, flexible lead, removable wire mesh shelf and six wooden rails for airing purposes. It is 37in high by 19¾in wide by 15¾in deep and is finished in white enamel with black enamelled base. Alternative colours of red, green and blue will also be available. The cabinet is mounted on ball bearing castors.



Cutaway view of the "Taypen" drying cabinet

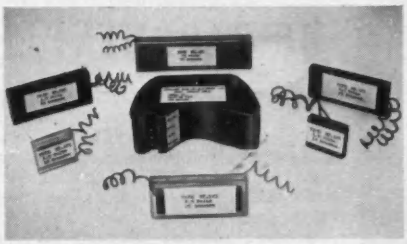
Two closed front models are available and the respective prices are £11 11s 6d plus £2 7s 4d purchase tax, and £9 14s plus £2 2s 9d tax. The lower priced model is supplied without a wire mesh shelf and has smaller castors. There is also a de luxe model with two folding doors in front and fitted with an outside adjustable side rail. This costs £12 14s 9d plus £2 17s 8d purchase tax.

Silver-Zinc Accumulator

A silver-zinc accumulator cell completely sealed in resin, type HT 125,

which has been produced to meet the need for a small, light rechargeable battery of any desired voltage, is announced by VENNER ACCUMULATORS, LTD., Kingston By-Pass, New Malden, Surrey. The design is based upon the production of strips of from one to ten cells which can be arranged in any desired form before potting in resin.

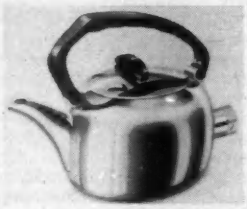
The cell has a nominal capacity of 0·125 Ah, being suitable for discharge over a range of currents from 10 to 500 mA. This discharge range meets the requirements of many transistor applications and also current requirements too high for small dry cells. A single cell weighs ½ oz and measures 1⅛in by 1¼in by $\frac{5}{32}$in. The size and weight ratio improves as the number of cells in a battery increases, since the thickness of potting resin remains sensibly constant. No topping-up or maintenance is required.



Venner type HT 125 silver-zinc accumulators encapsulated in resin

Electric Kettles

Two new models have been added to the range of kettles manufactured by BEST PRODUCTS, LTD., Felix Road, Felixstowe. The first of these is the "Essex," the polished aluminium model with black or red fittings, and the second, the "Suffolk," of similar



Best Products "Essex" kettle

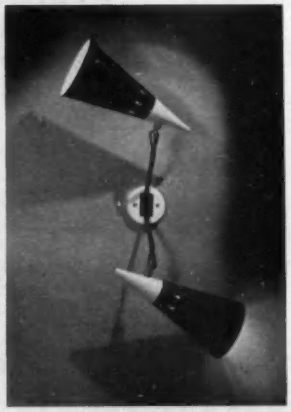
design but in polished chromium-plated copper. Both models are available in 3 and 3½ pt sizes and the respective loadings are 2 kW (3 pt) and 1,500 W (3½ pt). The prices are as follows:—"Essex," £3 0s 4d plus 13s 2d purchase tax (3 pt) and £2 17s 5d plus 12s 7d tax (3½ pt); "Suffolk," £4 0s 10d plus 17s 8d tax (3 pt) and £3 17s 11d plus 17s 1d tax (3½ pt).

The company also announces a new version of its "Fanfare" four-note alarm kettle. This model now incorporates a pencil type element (1,500 W), thus dispensing with the need to remove the base of the kettle to change the element. It is offered in chromed copper with black or red fittings, price £4 15s plus £1 0s 10d tax, or lacquered copper with black fittings, price £4 7s 6d plus 19s 2d tax.

Lighting Fittings

A twin arm fitting has been added to the "Harlequin" range of lighting fittings manufactured by TROUGHTON & YOUNG (LIGHTING), LTD., 143, Knightsbridge, London, S.W.1. It can be used with the many varied assemblies of the original range using metal reflectors in black, white, red, blue, grey or lemon. Alternatively, shades are available in plain flashed opal glass or ceramic fired with two-line decoration. It can be used as a ceiling fitting or a wall bracket and can be fixed either horizontally or vertically. The back plate is white and the arms black, fitted with brass universal joints. The assemblies are at approximately 14in centres.

The fitting illustrated is type 17/63/B, the price of which is £5 18s plus £1 3s 7d purchase tax in the United Kingdom.



Troughton & Young type 17/63/B twin arm fitting

Domestic Electrode Hot Water Boiler

A new electrode hot water boiler, the "Bantam," has recently been introduced by Bastian & Allen, Ltd., Ferndale Terrace, Harrow, Middlesex, for domestic use. It is claimed to be the smallest of its kind, measuring only 20in high by 12½in in diameter.

The boiler consists of a cylindrical steel shell with steel end plates, one of which can be removed with the electrodes and load adjustment mechanism. Water circulating through the boiler is heated by the passage of electricity from one electrode to another. The required rating is obtained by raising or lowering insulating shields over the electrodes, thereby increasing or reducing the power input. Once these shields have been set, adjustment is only necessary if extensions to the heating system are desired. The boiler is suitable for a maximum rating of 20 kW on a 400/440 V three-phase supply and the output is adjustable up to 68,000 B.Th.U./hr. Alternative ratings for other voltages are available upon request.

The "Bantam" is completely automatic and is supplied with a small control box containing a circuit-breaker, a silent contactor, an ammeter and a control circuit fuse. There are also thermostats and controls including a time switch which is mounted on the control panel. The boiler and control box can be obtained in a range of colours including white, cream, blue hammer, green hammer or silver hammer. It is guaranteed for twelve months and the electrodes for five years. The price, delivered, is £130.

Bastian & Allen "Bantam" domestic electrode hot water boiler installed in the kitchen of a chalet type bungalow. A false cupboard is normally placed over the boiler which matches the remaining kitchen furniture and gives a working table top

GENERATION AND DEVELOPMENT

Sharp Rise in Output

An exceptionally large increase in electricity output is recorded in the return of the Ministry of Power for March, a month in which cold weather conditions prevailed. The Central Electricity Generating Board, the North of Scotland Hydro-Electric Board and the South of Scotland Electricity Board generated a total of 9,448 million kWh; this was 21·3 per cent more than in March, 1957, and brought the average rate of increase in the first quarter of this year up to 14·3 per cent (see Table 1).

In the 13 weeks to 29th March 2,829 million kWh (3·5 per cent increase) was generated by industry, excluding railways, transport undertakings, coal mines, gas works and petroleum refineries.

At 31st March the total capacity of generating plant installed in public supply stations was 26,710 MW, an increase of 99 MW during the month.

New plant commissioned in C.E.G.B. stations included a 60 MW Metropolitan-Vickers set and a 60 MW-equivalent boiler at South Denes; a 26 MW Mitchell boiler at Acton Lane "B"; and a 30 MW B.T.H. set with a 30 MW Clarke Chapman boiler at Goldington.

Table 2 analyses the sales of Area Boards in England and Wales. The national figures show an increase over March, 1957, of 22·1 per cent but, when corrected for weather conditions and working days, the increase is 9·9 per cent.

Increased Generating Efficiency

The overall average thermal efficiency of power stations in England and Wales during 1957 was 25·38 per cent compared with 24·70 per cent for the previous year, states the Central Electricity Generating Board. This represents a saving of 1¼ million tons of coal and a reduction in operating cost of £5 million. Of nearly 78,000 million kWh supplied nearly 30 per cent was provided by the 20 most efficient stations operating throughout the year. These 20 stations had an average efficiency of 29·45 per cent, their individual efficiency percentages being shown in the above table.

Station	Thermal Efficiency per cent
Castle Donington, near Derby	31·92
Drakelow, Burton-on-Trent	31·02
Littlebrook B, Dartford, Kent	30·20
Stourport B H.P., Worcs.	30·08
Wakefield B, Yorks.	30·07
Portishead B, near Bristol	29·97
Stella South, near Newcastle-upon-Tyne	29·90
Meaford B, Stone, Staffs.	29·83
Stourport B L.P., Worcs.	29·70
Stella North, near Newcastle-upon-Tyne	29·32
Hams Hall C, near Birmingham	29·17
Ince, near Ellesmere Port	29·13
Barking C	29·10
Battersea B	29·08
Dunston B II, Newcastle-upon-Tyne	29·01
Marchwood, near Southampton	28·95
Skelton Grange, Leeds	28·83
Carrington, near Manchester	28·75
Tilbury	28·71
North Tees C, Middlesbrough	28·53

Progress at Hinkley Point

Work on the concrete foundations of the first reactor of the Hinkley Point nuclear generating station, which is being built for the Central Electricity Generating Board by the English Electric–Babcock & Wilcox–Taylor Woodrow group, has now been completed and construction of the 90ft high, 75ft diameter biological shields has started. Progress is being made on the foundations for the circulator houses and steam raising units.

Another important development is taking place on the sea front where a 3,000ft long mass concrete sea wall is to be constructed, incorporating the pumphouse for the circulating water system. Sea water will be used for cooling purposes at the rate of 35 million gallons per hour conveyed to the pumphouse through two 11ft diameter tunnels from an intake structure 2,200ft offshore.

A small township now exists adjacent to the site, capable of housing 400 men. The present labour force totals 1,200.

Strathleven Reinforcement

The South of Scotland Electricity Board has approved a reinforcement scheme at Strathleven substation. The effect will be that the area east of Dumbarton, at present supplied direct from Strathleven at 11 kV, will be fed from a new 33/11 kV substation at Highmains, Dumbuck, which will be supplied from Strathleven at 33 kV, thus relieving the latter substation of part of its 11 kV load. The estimated cost is £127,000.

Wallasey Deputation

The Minister of Power last week received a deputation, led by the Postmaster General, Mr. Ernest Marples, as Member for Wallasey. The deputation made representations about

TABLE 1.—ELECTRICITY GENERATED AND SENT OUT FOR PUBLIC SUPPLY

	Fuel consumed Thousand tons			kWh generated Millions			kWh sent out Millions	Installed capacity (m.c.r.) MW
	Coal	Coke and Breeze	Oil	Steam	Water power	Total		
Central Electricity G.B.	4,262	87	132·0	8,657	10	8,677	8,160	24,333
North of Scotland H.E.B.	18	—	1·5	29	163	198	196	912
South of Scotland E.B.	291	6	0·2	549	24	573	544	1,465
Total for March, 1958	4,571	93	133·7	9,235	197	*9,448	8,900	26,710
Corres. total for March, 1957	3,923	77	12·5	7,569	208	7,788	7,323	24,779
Inc. or dec., per cent	+16·5	+20·9	+965·7	+22·0	−5·3	+21·3	+21·5	+7·8
Total to date (3 months), 1958	13,703	284	381·3	27,502	699	28,250	26,621	
Total for corres. 3 months of 1957	12,469	255	39·0	23,905	766	24,708	23,258	
Inc. or dec., per cent	+9·9	+11·5	+878·5	+15·0	−8·8	+14·3	+14·5	

* The total figure includes generation by other methods amounting to 16 million kWh.

TABLE 2.—ELECTRICITY SENT OUT BY AREA BOARDS FOR THEIR CONSUMERS

Area Board	Totals for March (million kWh)			Twelve Months Totals Ended 31st March (million kWh)		
	1957	1958	Inc. or Dec. %	1957	1958	Inc. or Dec. %
London	620·0	796·7	+28·5	6,867·1	7,443·7	+ 8·4
South Eastern	387·3	511·4	+32·0	4,403·9	4,866·4	+10·5
Southern	489·3	632·3	+29·2	5,414·4	6,119·5	+13·0
South Western	242·1	305·6	+26·2	2,736·1	2,989·5	+ 9·3
Eastern	639·1	803·5	+25·7	7,071·6	7,839·9	+10·9
East Midlands*	546·5	644·0	+17·8	6,053·9	6,575·1	+ 8·6
Midlands*	694·8	863·1	+24·2	7,707·6	8,496·5	+10·2
South Wales*	421·6	467·4	+10·8	4,545·8	4,903·6	+ 7·9
Merseyside and North Wales*	418·4	498·6	+19·2	4,750·7	5,152·1	+ 8·4
Yorkshire*	706·8	830·5	+17·5	7,876·2	8,549·8	+ 8·6
North Eastern*	397·6	480·7	+20·9	4,544·0	4,977·7	+ 9·5
North Western*	728·8	843·0	+15·7	8,239·4	8,788·0	+ 6·7
Total all Area Boards	6,292·3	7,676·8	+22·0	70,210·7	76,701·8	+ 9·2
Direct Supplies by C.E.G.B.	197·0	246·4	+25·1	2,225·7	2,579·3	+15·9
Grand Total	6,489·3	7,923·2	+22·1	72,436·4	79,281·1	+ 9·4
Mainly Industrial Areas*	3,914·5	4,627·3	+18·2	43,717·6	47,442·8	+ 8·5
Mainly Non-Industrial Areas	2,377·8	3,049·5	+28·2	26,493·1	29,259·0	+10·4

* Those in which industrial consumers took over 50% of the total sales in the preceding financial year.

the electricity supply position in the borough in view of many recent public complaints. The chairman of the Merseyside and North Wales Electricity Board and the chairman of the Consultative Council were present. The Minister undertook that the representations made would be fully examined so that all possible steps could be taken to improve the position. Mr. Marples said that he would keep in touch with the Minister.

Loughborough College Power Supply

Leicestershire Education Committee has approved a decision of the governors of Loughborough College to close the generating station in Packe Street, Loughborough, that for over 30 years has been providing electricity for the college buildings and training workshops. The station will be closed in September and electricity will be taken from the grid. After the 1914-18 war engines from a captured German U-boat were used in the generating station to drive the generators until eventually they wore out and were replaced by British-built diesels.

Dust Nuisance at Newcastle

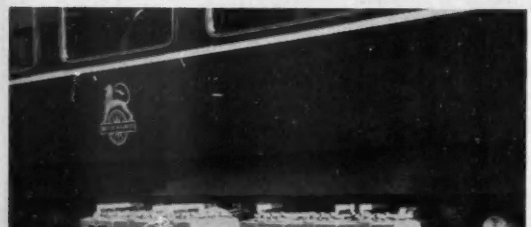
Newcastle-on-Tyne City Health Committee has asked King's College to make an independent survey of the dust nuisance in the west end of Newcastle, stated to be due to the Stella power stations. At a meeting of the Committee a letter was read from the Central Electricity Generating Board, referring to improvements in the performance of dust extractors at the power stations, but committee members expressed dissatisfaction with the position. It was stated that atmospheric pollution in the early part of this year had been greater than last year.

Battery Railcar Service Starts

The first battery railcar in Great Britain was brought into regular service on Monday last when British Railways (Scottish Region) introduced an augmented service of six trains in each direction every weekday on the 43-mile Deeside railway between Aberdeen and Ballater. This improved service will include three runs in each direction by the battery railcar.

A description of the railcar, which consists of a motor coach and trailer, was published in our 4th April issue (page 646). Two electric motors for propelling the train are fitted to a bogie under the motor coach and there are driving compartments in both the motor and trailer coaches. The battery is installed in sections of 8 tons under each coach, and is arranged in cradles which can be partially withdrawn for maintenance and inspection.

Cradle withdrawn for inspection of the battery of the Deeside railcar



Hotel Tariffs

At a meeting of the North Eastern Electricity Consultative Council a complaint was received from a Scarborough hotel proprietor. He said that during the winter months when his hotel was closed he still had to pay about half what his electricity cost in the summer months when the hotel was open.

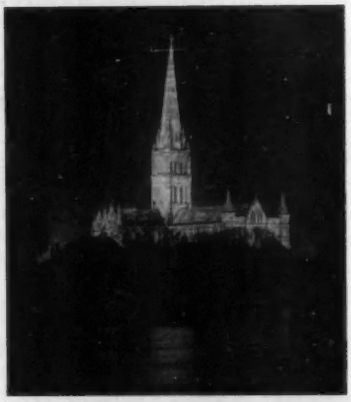
The chairman of the Council (Mr. W. S. Hall) said that this was a matter about which hotel proprietors had always complained. The Electricity Board had replied that it had to keep plant ready in case a supply was needed at any time.

Heating Installation

Manchester Education Committee has approved a proposal that the heating of the new premises of the Domestic and Trades College shall be by electricity, the estimated cost being £26,000. The prices quoted by the North Western Electricity Board for the electrical installation and power supply are based on an off-peak thermal storage system, the rooms being heated by radiators and pipes in the normal way.

Salisbury Cathedral Floodlit

As part of the celebrations marking the 700th anniversary of its consecration, Salisbury Cathedral has been floodlit by the A.E.I. Lamp & Lighting Co. The company's lighting engineers were faced with the problem of lighting a building over 450ft long with a 404ft spire without obstructing the paths or dazzling people on the lawns. The problem was solved by the use of special low brightness wide-beam projectors spaced at intervals on the perimeter of the lawn round the Cathedral to light the main fabric of the building, with compact banks of narrow-beam projectors focused on the tower and spire. "Mazda" 1,500 W tungsten lamps are used in both types of projector.



Salisbury Cathedral floodlit to celebrate the 700th anniversary of its consecration

The installation was carried out by the Southern Electricity Board. Some four miles of cable and 90 floodlighting projectors, each housing a "Mazda" 1,500 W g.l.s. lamp, were used.

Floodlighting of London Buildings

Floodlighting of public buildings in London daily from lighting-up time until midnight is to start next Monday, 28th April, and will continue until Sunday, 28th September. Electricity for floodlighting is being supplied free by the London Electricity Board.

OVERSEAS

Snowy Mountains Dispute

The Adelaide correspondent of *The Times* reports that the South Australian Government has issued a High Court writ challenging the validity of the Snowy Mountains agreement under which the hydro-electric power and irrigation water will be shared by New South Wales and Victoria. The South Australian Premier, Sir Thomas Playford, contends that the agreement does not afford protection for South Australia's rights to water from the River Murray.

The writ seeks a declaration that the Snowy Mountains Hydro-Electric Power Act is beyond the power of the Commonwealth and invalid in so far as it purports to authorise the diversion of the Tooma or any other tributary of the Murray; a declaration that the proposed diversion is not authorised by law; an injunction restraining the Commonwealth Government and its agents from diverting or otherwise interfering with the natural flow of the Tooma or any Murray tributary; and a declaration that water diverted from the Snowy River into the Murray will become subject to the River Murray Waters Agreement.

DOMESTIC ELECTRICAL EQUIPMENT

Dry Shavers

THE following survey contains a list of ten manufacturers and distributors of electric dry shavers. An innovation since we last dealt with this subject is the introduction of models specially designed for women. Three manufacturers have added such models to their ranges, namely, Remington Rand, Ltd. (" Princess "); Ronson Products, Ltd. (" Lady Ronson "); and Sunbeam Electric, Ltd. (" Lady Sunbeam Shavemaster ").

The majority of dry shavers are driven by a vibrator type movement and are suitable for use on a.c. supplies only. Other more expensive types are fitted with impulse motors and can be used on either a.c. or d.c., covering a voltage range from 100 to 250 V. Battery models for either 6 or 12 V are available for car owners while Perihel, Ltd., offer their " Travelux " shaver which is fitted with a rechargeable battery.

A recent announcement from Chilton Electric Products, Ltd., states that they are at present only manufacturing and marketing one shaver model, the " Sportsman." Pifco, Ltd., have added a second model to their range, the " Pifco Prince," with built-in hair trimmer and " Varishave " speed adjuster.

Manufacturer or Distributor	Name or Model	Type	Weight	Voltage Range	Special Features	Finish	Price (excl. tax)	Purchase Tax
ARVIN ELECTRIC, LTD., Fernbrook Avenue, Southend-on-Sea (subsidiary of Ever-Ready Razor Products, Ltd.).	" Fernbrook "	Vibrator	10 oz	200/250 a.c.	Synchronous pulsating motor. Stainless steel outer shear	Pale grey plastic body, chromium head unit, rexine covered steel case	£6 0 1	£1 4 8
	" Fernbrook " with " Close-Clipper "	Vibrator	11½ oz	200/250 a.c.	Synchronous pulsating motor. Detachable stainless steel outer shear and long hair trimmer	Nautical grey plastic body, chromium head unit, red rexine covered steel case	£6 3 11	£1 6 1
	" Standard "	Vibrator	11¼ oz	200/250 a.c.	Synchronous pulsating motor, detachable stainless steel outer shear	Nautical grey plastic body, chromium head unit, check design rexine covered steel case	£5 4 1	£1 1 11
CHILTON ELECTRIC PRODUCTS, LTD., Hungerford, Berks.	" Sportsman "	Vibrator	8 oz	220/240 a.c.	Extra-wide shim head, quiet action	Chestnut brown and cream and matching case	£4 10 10	£0 19 2
INGLIS KNIBB & CO., Tooks Court, Cursitor Street, London, E.C.4.	" Unic " 54	Vibrator	11 oz	200/250 a.c.	Side trimmers	Cream plastic	£4 16 6	£1 0 6
	" Unic " Super-Vedette	Single and multi-voltage motor	11 oz	200/250 a.c. and 110/125, 125/140, 145/165, 200/250 a.c./d.c.	Rotary side trimmers	Cream plastic	£8 13 6 (single voltage) £9 3 6 (multi-voltage)	£1 16 10 (single voltage) £2 2 6 (multi-voltage)
	" Unic " Autoshaver	Single volt motor	11 oz	6 or 12 V	Side trimmers, suitable for operation from car battery	Cream plastic	£8 10 4	£1 18 4
	" Unic " Selection	Impulse motor	15 oz	110/125, 125/140, 145/160, 200/250 a.c./d.c.	Extra large shaving head, side trimmers	Cream plastic	£12 3 6	£2 9 6
PERIHEL, LTD., West Mall Works, 27-29, Rabbit Row, London, W.8.	" Travelux "	Re-chargeable battery	10 oz	110/240 for re-charging purposes	Rotating cutter head, self-sharpening, on/off switch	Ivory plastic, zipped leather case	£7 7 0	£1 12 9
	" Accura "	Storage battery, car battery - or mains operated	11½ oz	6 or 110/240 a.c.	Self-sharpening rotary head, on/off switch	Ivory plastic, zipped leather case	£8 15 0	£1 15 0
PHILIPS ELECTRICAL, LTD., Century House, Shaftesbury Avenue, London, W.C.2.	" Philishave " 7743	Mains operated, dual voltage	8½ oz	110/130–200/250 a.c./d.c.	Rotary action. Slide-switch for voltage adjustment	Cream plastic	£6 4 5	£1 9 9
	" Philishave " 7749	Battery operated	8½ oz	3 1½ V batteries or, by special adaptor, 6 or 12 V car batteries	Rotary action	Maroon plastic	£6 4 0	£1 8 6
	" Philishave " 7778	Standard single voltage	8½ oz	200/250 a.c./d.c.	Rotary action	Cream plastic	£5 11 7	£1 5 11
	" Ladyshave " 7780	Standard single voltage	8 oz	200/250 a.c.	Rotary action	Pastel pink plastic	£4 18 0	£1 1 6

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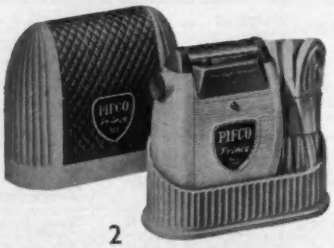
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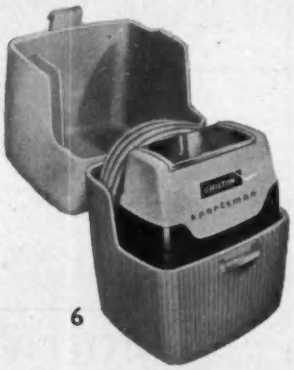
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1. *"Unic" Super-Vedette (Inglis Knibb & Co.)*
2. *"Pifco Prince"*
3. *Arvin "Fernbrook" with "Close-Clipper"*
4. *Philips "Philishave" model 7778*
5. *Philips "Ladyshave" model 7780*
6. *Chilton "Sportsman"*
7. *Remington "Princess"*
8. *Remington "Four-Most"*

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Manufacturer or Distributor	Name or Model	Type	Weight	Voltage Range	Special Features	Finish	Price (excl. tax)	Purchase Tax
PIFCO, LTD., Pifco House, Watling Street, Manchester, 4.	"Pifco" 1126	Vibrator	9½ oz	200/250 and 100/110 a.c.	Wafer-thin cutting head. Complete in plastic container	Cream plastic	£3 6 10	£0 14 8
	"Pifco Prince"	Vibrator	9½ oz	200/250 a.c.	"Varishave" speed adjuster, built-in hair trimmer	Ivory plastic with matching case	£5 3 4	£1 2 8
REMINGTON RAND, LTD., 26-40, Kensington High Street, London, W.8.	"Super 60" De Luxe Regular	Double insulated impulse motor	10½ oz	210/240 a.c./d.c.	"Roller combs," spring loaded cutters, contour curved multiple heads	Two-tone grey plastic, suede covered presentation case	£8 6 0	£1 15 3
	"Super 60" De Luxe Triple-Volt	Double insulated impulse motor	10½ oz	110/130, 140/160 and 190/240 a.c./d.c.	"Roller combs," spring loaded cutters, contour curved multiple heads, voltage change switch	Two-tone grey plastic, suede covered presentation case	£9 3 0	£1 18 11
	"Super 60" De Luxe Auto-Home	Double insulated impulse motor	10½ oz	6 or 12 and 110/125 or 6 or 12 and 210/240 a.c./d.c.	Complete with dashboard fitting for car use	Two-tone grey plastic, suede covered case	£9 9 0	£2 0 2

Manufacturer or Distributor	Name or Model	Type	Weight	Voltage Range	Special Features	Finish	Price (excl. tax)	Purchase Tax
REMINGTON RAND, LTD., 26-40, Kensington High Street, London, W.8. *(continued)*	" Four-Most "	Double insulated vibrator motor	10½ oz	110/150 and 210/240 a.c.	Dual-volt change switch, contour curved shaving heads	Two-tone grey plastic, real hide carrying case	£5 13 4	£1 4 1
	" Princess "	Double insulated vibrator motor	7 oz	210/240 a.c.	Contained in jewel-box presentation case	Delicate pink	£5 3 11	£1 2 1
B. H. RIES, LTD., 19-21, Hatton Garden, London, E.C.1.	" Richard Supershaver "	Rotary and clipper heads	12 oz	110/140, 200/250 a.c./d.c.	Enlarged shaving head plus trimming head	" Perspex " body. Leather zip pouch	£7 15 5	£1 13 7
	" Richard Cadet "	Rotary head	10 oz	110/140, 200/250 a.c./d.c.	Clipper head available 25/- extra	Red and grey nylon body	£5 15 4	£1 3 8
	" Richard Cadet " De Luxe	Rotary head	10 oz	110/140, 200/250 a.c./d.c.	Complete with clipper head and zip leather pouch	Red and grey nylon body	£7 0 0	£1 10 0
ROLLS RAZOR, LTD., 255, Cricklewood Broadway, London, N.W.2.	" Rolls Viceroy " A.C.	Vibrator	10½ oz	200/250 a.c.	Self-starting. Lamp adaptor supplied	Maroon plastic body, travelling case	£4 10 0	£0 19 9
	" Rolls Viceroy " V-Ten	Impulse motor	12 oz	90/250 a.c./d.c.	Angled multi-heads, on/off and voltage change switches. Lamp adaptor supplied	Coffee and deep cream plastic body. Silk and velvet lined case	£8 5 0	£1 16 3
	" Rolls Viceroy " A.C.-Four	Vibrator	10½ oz	100/130 and 200/250 a.c.	Multi-heads, on/off and voltage change switches	Beige and maroon plastic body. Travelling case	£6 2 2	£1 8 4
RONSON PRODUCTS, LTD., 352-3, Strand, London, W.C.2.	" Ronson Standard "	Vibrator	9½ oz	100/125 and 200/250 a.c.	On/off switch. Complete in " stow-away " pack	Cream moulded body, black plastic head	£5 14 7	£1 4 11
	" Ronson with Super Trim "	Vibrator	9½ oz	100/125 and 200/250 a.c.	On/off switch, transparent guard, cool running, trims as well as shaves	Cream moulded body, chromium head, in presentation case (*a*) or in leather " trip kit " with toilet accessories (*b*)	£7 6 8 (*a*) £8 13 6 (*b*)	£1 10 10 (*a*) £2 4 0 (*b*)
	" Lady Ronson "	Vibrator	7½ oz	200/250 a.c.	Presentation case	Pastel pink or blue	£4 17 1	£1 0 5

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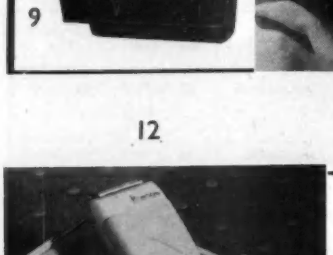
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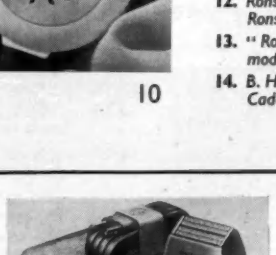
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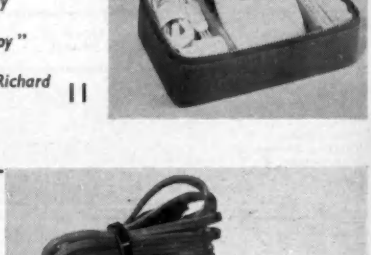
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9. *Sunbeam " Silver Glide " model " Shavemaster "*
10. *" Lady Sunbeam " " Shavemaster "*
11. *" Ronson with Super Trim " in leather " trip kit "*
12. *Ronson " Lady Ronson "*
13. *" Rolls Viceroy " model V-Ten*
14. *B. H. Ries " Richard Cadet "*

Manufacturer or Distributor	Name or Model	Type	Weight	Voltage Range	Special Features	Finish	Price (excl. tax)	Purchase Tax
SUNBEAM ELECTRIC, LTD., Nerston, East Kilbride, Lanarkshire.	"Silver Glide" "Shavemaster" XC	16-bar armature motor	12 oz	210/250 a.c./d.c.	2-year guarantee. Double-edged hollow-ground oscillating cutter. Stand-up case	Plastic and chrome-plated steel. In brown, burgundy, grey, tan, black and white	£8 16 5	£1 18 9
	"Silver Glide" "Shavemaster" XCR	16-bar armature motor	12 oz	100/140, 190/250 a.c./d.c.	2-year guarantee. Double-edged hollow-ground oscillating cutter. In luxury leather case. Dual voltage	Plastic and chrome-plated steel. In brown, burgundy, grey, tan, black and white	£9 15 7	£2 2 11
	"Shavemaster" W-ZA	16-bar armature motor	12 oz	210/250 a.c./d.c.	2-year guarantee. Double-edged hollow-ground oscillating cutter. Leather zip pouch	Grey plastic and chrome-plated steel	£6 16 6	£1 11 6
	"Shavemaster" W-RA	16-bar armature motor	12 oz	100/140, 190/250 a.c./d.c.	2-year guarantee. Double-edged hollow-ground oscillating cutter. Leather zip pouch. Dual voltage	Grey plastic and chrome-plated steel	£7 12 10	£1 16 2
	"Lady Sunbeam" "Shavemaster"	Vibrator	6 oz	230/250 a.c. only	1-year guarantee. Presentation box	Blue, pink or turquoise plastic, and highly buffed gilt finish	£4 16 4	£1 1 2

FACTORY EQUIPMENT EXHIBITION

ABOUT 300 exhibitors took part in the sixth Factory Equipment Exhibition which was held last week at Earls Court, London. The exhibition, sponsored by the promoters of the *Factory Manager* and *Factory Equipment News*, was opened by Sir David Eccles, President of the Board of Trade, and had the support and co-operation of the British Productivity Council and leading trade and industrial associations.

Although the number of actual electrical manufacturing concerns represented at the exhibition was small, a wide range of electrical apparatus was to be seen covering such fields as heating and ventilating equipment, instruments for automatic control, floor cleaning machines, catering equipment, etc. Most surprising, however, in view of the importance of good lighting in the modern factory, was the almost complete absence of lighting manufacturers and lighting equipment.

Industrial Cleaners

Among the electrical maintenance equipment exhibited by the Martindale Electric Co. were two new industrial vacuum cleaners. The "Martinet" wet/dry suction cleaner is capable of picking up liquids as well as dirt and consists of a standard Martindale blower mounted on a rust-proofed 4 gal tank, on wheels, with filter bag, hose and suction tool attachments. The other new cleaner, the "Port-A-Vac," consists of a standard portable blower, this time attached to a lightweight steel harness with canvas supporting straps. The company also showed their "Super" siren which has an audible range of ½ mile in still air and can be operated for periods of up to an hour without overheating the motor. Another company showing new heavy duty floor cleaning equipment was the Progress Organisation (Division of Gordon Fillery, Ltd.), who had on view for the first time their new "Universal" and "General" models. The "Universal" is claimed to be capable of polishing 6,000 sq ft and scrubbing 4,000 sq ft per hr.

Truvox, Ltd., exhibited a new model of their industrial floor polisher/scrubber. The general design, rectangular in plan, is based on its predecessor, the "Oco," which will be retained for d.c. voltages. The new model incorporates a silent induction motor together with a thermal cutout to prevent overloading. The range of floor cleaning plants manufactured by Columbus-Dixon, Ltd., and New Welbeck, Ltd., were also represented on their respective stands.

Heron Heating Devices, Ltd., exhibited electrically heated flexible hoses, pipe-tracing elements, drum heaters for melting and emptying solids and semi-solids from containers of all types, and base heaters, as an alternative method of drum heating. Of particular interest on this stand was the recently introduced "Electropitcher" designed for the shipbuilding industries. With it a continuous length of deck seam can be "payed" without the constant walking to and fro necessary when using the boiling and ladle method. Each model is thermostatically controlled and has a capacity of 10 lb liquid compound. The loading is 1,500 W.

On the stand of Colt Ventilation, Ltd., the company's "Two Way" window fan which simultaneously extracts stale air and brings in fresh replacement air, using only one impeller, was demonstrated. The Greenwood's & Airvac Ventilating Co., Ltd., apart from a comprehensive range of ventilating equipment, also showed their "GA" underfloor and skirting ducting, a convenient and economical method of installation which allows for a wide variety of electrical services. Packaged air conditioners ranging from units for use as central air conditioning plants with between 5 and 10 ton capacity to a small window type model, were shown by Brightside Heating & Engineering Co., Ltd.

Commercial Catering

This year the display of the British Electrical Development Association concentrated on electrical applications in works canteens, and typical appliances suitable for large-scale catering work were shown, including the latest developments in commercial cooking and infra-red grills. Among other exhibitors of catering equipment were G. F. E. Bartlett & Son, Ltd., who displayed all types of cooking and food service equipment, water boilers, hotcupboards and automatic tea and coffee making appliances, and W. M. Still & Sons, Ltd.

Financial Section

STOCKS and SHARES

THIS year's Budget was not of a kind to make any major or lasting impression on the Stock Exchange as a whole. A certain amount of business had been pent up as usual in advance of the event, but when this had been dealt with, markets soon became preoccupied with the problems still outstanding. In the gilt-edged market, prices remained very firm, and although some irregularity reappeared among industrials, many shares improved further on the quite substantial advances accomplished in the previous week or two. The Chancellor's proposals to reduce the purchase tax on many electrical appliances reacted well, of course, upon the shares of companies specialising in such products, and was a helpful factor also in the case of the bigger manufacturing groups where the interests in domestic equipment are more diluted. Simplification of the company profits tax is warmly welcomed.

Purchase Tax Changes

Among the shares to react well to the proposed purchase tax changes, Hoover were prominent in rising half-a-crown, to 38s. Morphy-Richards, Vactric, British Vacuum Cleaner and Burco Dean were all marked up by 1s or more, and there were improvements also in Berry's Electric and Parnall (Yate). G.E.C. gained 1s 6d, to 33s 3d, and English Electric at 56s 3d were also more than a shilling to the good. Fairly numerous other gains in the electrical lists included those in Reyrolle (following the full report), Crompton Parkinson, Ericsson, and Marryat & Scott. Several "radio" shares were strong, and Elliott-Automation moved up to 13s 3d in advance of the dividend declaration.

B.I.C.C. Results

The extent of the decline in the profits of British Insulated Callender's Cables for 1957 proved to be very much in line with expectations based on the half-yearly report issued last November. At 43s 9d, the price of the £1 shares was quoted 1s higher after the publication of the preliminary statement of the results, and the decision to maintain the dividend for the year at a total of 12½ per cent, as before. Turnover is stated to have been fully maintained, and the fall of £1·6 million in the group trading surplus, to £7·8 million, is ascribed to a combination of lower profit margins, dislocations due to major re-planning schemes and the fall in the price of copper. Leaving exceptional items out of account, the net profits appear to cover about two and a half times over the cost of the ordinary dividend, on the basis of which the shares show a yield of 5¾ per cent.

Cable Companies

Telegraph Construction & Maintenance £1 shares moved up well to 27s after the company's announcement of an improvement in net profits from £216,000 to £250,000 (after a heavier tax charge). The dividend is being repeated at the previous total of 7½ per cent, and the bonus is raised from 1 to 2½ per cent: this extra 1½ per cent

Price Changes in

Company or Board	Nom. Value	Middle price 21st Apr.	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield % £ s d	1958 Highest	1958 Lowest
Gilt-edged Stocks								
Brit. Elec. 1968/73	100	75	+½	3	3	4 0 0	75	72
Brit. Elec. 1974/77	100	72	+½	3	3	4 3 3	72	68½
Brit. Elec. 1976/79	100	75½	+1	3½	3½	4 12 9	75½	72
Brit. Elec. 1974/79	100	85	+1	4¼	4¼	5 0 0	85¼	82⅜
Overseas Electric Supply								
Calcutta Elec.	£1	15/6		6†	6·8†	8 16 0†	16/9	15/-
East African Power	£1	19/-		7	7⅛	7 18 0	19/3	17/6
Nigerian Elec.	£1	15/-		10	10	13 6 9	17/-	14/9
Perak Hydro-Elec.	£1	14/6		10	12½	17 4 9	15/6	14/6
Electrical Shares								
Aberdare Cables	5/-	11/6	+3d	17½	17½	7 12 3	11/6	9/9
Aerialite	1/-	6/9		48	51½	7 12 9	6/9	5/1
Allen, W. H.	£1	34/6		10	10	5 16 0	35/-	32/9
Anglo-Portuguese Tel.	£1	23/3	+1/3	8	8	6 17 9	23/3	19/9
Aron Elec. Ord.	£1	53/9		15	15	5 11 6	54/6	53/-
Assoc. Elec. Ord.	£1	50/9	+9d	15	15	5 18 3	51/3	46/6
Automatic Tel. & El.	£1	66/3	+1/9	17	17	5 2 6	66/3	57/-
Babcock & Wilcox	£1	49/3	+6d	15	13‡	5 5 6	52/9	41/9
Bakelite	10/-	18/9	+1/-	15	15	8 0 0	21/-	17/6
Baldwin, H. J.	2/-	2/9		20	20	14 10 9	3/9	2/9
Berry's Electric	5/-	7/6	+9d	—	10	6 13 3	7/6	5/9
British Aluminium	£1	42/6	−1/9	12	12	5 13 0	47/-	40/9
Brit. Elec. Traction: Def. Ord. "A"	5/-	23/6		22½	25	5 6 6	23/6	19/6
B.I. Callender's	£1	43/9	+1/-	12½	12½	5 14 3	43/9	38/9
B.I. Callender's 6% Pref.	£1	20/-		6	6	6 0 0	20/3	19/6
British Tabulating	£1	45/-		9	10	4 9 0	45/-	38/6
British Thermostat	5/-	23/9		25	25	5 5 3	23/9	19/9
British Vac. Cleaner	5/-	4/9	+3d	15	10	10 10 6	5/1	4/6
Brook Motors	10/-	36/3		25	25	6 18 0	36/3	33/3
Bulgin, A. F.	1/-	5/-		40	45	9 0 0	5/6	4/7
Bulpitts	5/-	7/6		—	12½‡	8 6 9	7/6	7/6
Burco Dean	5/-	9/-	+1/-	20	22½	8 6 9*	9/6	7/9
Cable & Wireless: Ord.	5/-	9/6		10	10‡*	5 5 3	10/-	8/-
4% Loan	100	94½		4	4	4 4 9	94½	89
Chloride El. Storage "A"	£1	58/9	−3/3	17½	17½	5 19 3	62/-	55/6
Clarke Chapman	£1	120/-	−2/6	27½	27½	4 11 9	7½	5½
Cole, E. K.	5/-	18/-	+3d	17½	17½	4 17 3	18/-	15/6
Cossor, A. C.	5/-	5/6	+9d	Nil	2½	2 5 6	5/6	4/4
Crabtree	10/-	26/3		20	20	7 12 6	26/3	24/4
Crompton Parkinson Ord.	5/-	10/-	+6d	16	16	5 6 9*	10/3	8/3
De La Rue	5/-	24/6	+9d	30	35	7 2 9	25/3	20/9
Decca "A"	4/-	27/6	+9d	43¾	43¾	6 7 3	27/6	21/3
Desoutter	5/-	14/-		30	18¾*	6 14 0	14/3	13/6
Dewhurst	2/-	7/-		16½	20	5 14 3	7/9	6/9
Dictograph Tel.	2/-	5/9		20	20*	6 19 3	5/9	4/7
Dubilier Condenser	1/-	3/9		30	30	—	3/9	3/1
Duport	5/-	8/6	+6d	25	25	7 16 3*	9/4	8/-
E.M.I.	10/-	34/6	+1/-	15	15	4 7 0	34/6	27/6
Electrical Components	5/-	8/	+6d	25	12½*	7 16 3	8/-	7/-
Elec. Construction	£1	22/6		8½	8½	7 11 0	22/9	21/-
Elliott-Automation	5/-	13/3	+6d	—	10‡	3 15 6	13/3	11/6
Enfield Cable Ord.	£1	14/-	+3d	Nil	2½	3 11 6	14/-	10/9
English Electric	£1	56/3	+1/3	14	14	4 19 6	56/3	44/-
English Electric 3½% Pref.	£1	12/3		3½	3½	6 2 6	12/3	11/9
Ericsson Tel.	5/-	21/-	+1/-	22†	12†*	2 17 3†	21/-	17/6
Ever Ready	5/-	15/-	+3d	35	37½	6 5 0*	15/-	13/9
Falk Stadelmann	£1	37/6		17½	17½	9 6 9	38/-	35/-

The above quotations are based upon middle prices in the Stock Exchange Daily Official List.
* After scrip issue. † Free of income tax. ‡ Dividend indicated.

arises from credits of a special nature, and is evidently to be regarded as a non-recurring feature. Calculated on an 8½ per cent distribution, the yield on the shares works out at 6·3 per cent. London Electric Wire £1 shares remained little changed on balance, at 43s 9d, after news of the reduction in profits for last year. There remains an ample margin between earnings and the amount of the dividend, which is being maintained at 12½ per cent. Johnson & Phillips £1 shares, having risen in the first half of this month from 15s 6d to 25s, went back to 22s after the statement that the possibility of a merger with W. T. Henley's was under examination by the two companies.

Electrical Investments

Company or Board	Nom. Value	Middle price 21st Apr.	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield % £ s d	1958 Highest	1958 Lowest
Electrical Shares—continued								
G.E.C. Ord.	£1	33/3	+1/6	14	12½	—	38/9	29/3
G.E.C. 6½% Pref.	£1	20/9	+3d	6½	6½	6 5 3	21/3	20/3
General Cables	5/-	11/9		30	24	10 4 3	11/9	11/-
Greenwood & Batley	£1	47/6	+9d	17½	17½	7 7 3	48/-	45/-
Hackbridge Holdings	5/-	10/3	+6d	30	30	9 15 0	10/3	7/6
Hackbridge & Hewittic	5/-	12/-		23	20	8 6 9	12/-	9/7
Head Wrightson	5/-	17/9		20	22½	—	19/-	16/9
Heatrae	2/-	4/3		15	15	7 1 3	4/6	4/-
Henley's	10/-	14/6		11½	11½	7 18 6	14/6	10/6
Holophane	5/-	13/9		30	37½	8 3 9*	13/9	12/6
Hoover	5/-	38/-	+2/6	50	50	6 11 6	38/-	31/-
I.C.I.	£1	44/-x.d.		10	12	5 9 0	44/3	35/6
Intl. Combustion	5/-	24/6		22½	25	5 2 0	24/6	19/3
Johnson & Phillips	£1	22/-	−2/3	15	10	9 1 9	25/-	15/-
Lancashire Dynamo	£1	35/-		11	11	6 5 9	35/-	28/6
Laurence, Scott	5/-	13/9	+6d	15	15	5 9 0	14/6	12/6
Lister, R. A.	£1	24/3	+6d	10	10	8 5 0	26/3	23/-
London Elec. Wire	£1	43/9		12½	12½	5 14 3	43/9	39/6
Lucas, J.	£1	33/3	+6d	7½	7½	4 10 3	33/3	27/9
Marconi Marine	£1	32/-		10	10	6 5 0	32/-	29/-
Marryat & Scott	2/-	12/-	+6d	30	35	5 16 9	12/-	10/3
Mather & Platt	£1	54/3	+6d	15	15	5 10 6	54/3	43/9
Metal Industries	£1	29/6	+1/6	Nil	9	6 2 0	29/6	22/9
Midland Elec. Mfg.	£1	46/3		12½	12½	5 8 0	48/3	44/-
Morphy-Richards	4/-	16/3	+1/3	50	20*	4 18 6	16/3	14/6
Murex	£1	53/9		20	20	7 8 9	57/6	53/3
Newman Ind.	2/-	2/6		10	10	8 0 0	2/9	2/6
Oldham & Son	1/-	2/6		17½	17½	7 0 0	2/7	2/3
Parnall (Yate)	5/-	8/3	+9d	12	12	7 5 6	8/3	5/9
Parsons, C. A.	£1	46/3	−1/3	8¼	7½*	3 4 9	53/6	43/-
Plessey	10/-	59/-		30	30	5 1 9	59/-	55/-
Pye "A" Deferred	5/-	12/9	−1/-	12½	12½	4 18 0	13/9	10/-
Reyrolle	£1	82/6x.d.	+3/6	17½	17½	4 4 9	84/6	73/6
Rheostatic	4/-	6/9	+3d	12½	12½	7 8 3	8/-	6/6
Richardsons Westgarth	10/-	15/-	+6d	16¾	16¾	5 11 0*	15/-	13/-
Scottish Cables	4/-	13/9		27½	27½	7 17 6	13/9	12/3
Simon-Carves	5/-	23/9	+1/3	28¾	20*	4 4 3	25/-	22/6
Smith (England), S.	4/-	8/-		17½	20	5 0 0*	8/6	7/-
Southern Areas	£1	11/-	+1/-	7½	7½	13 12 9	11/3	9/6
Strand Elec.	5/-	4/9		15	15	15 15 9	6/3	4/9
Sturtevant	5/-	18/-		15†	15†	4 3 3†	18/-	17/6
Sun Elec.	£1	47/6		25	25	10 10 6	47/6	47/3
Switchgear & Cowans	5/-	11/9		25	22½	9 11 6	11/9	8/9
Taylor Tunnicliff	5/-	13/3	−6d	15	17½	6 12 0	13/9	11/9
T.C.C.	10/-	36/3		25	25	6 18 0	38/6	36/3
T.C. & M.	£1	27/-	+2/-	8¼	8¼	6 6 0	27/-	20/-
Telephone Mfg.	5/-	4/6		10	10	11 2 3	5/2	4/6
Telephone Rentals	5/-	10/6		12½	12½	5 19 0	10/6	9/9
Thompson (John)	5/-	26/6	−6d	25	25	4 14 3	27/-	23/-
Thorn Elec.	5/-	21/6		15	17½	4 1 6	21/6	19/9
Thornycroft	£1	25/-	+6d	12½	12½	10 0 0	27/9	21/-
Tube Investments	£1	54/-	−6d	13¾	15	5 11 0	54/6	48/3
Vactric	5/-	15/6	+1/3	17½	25	8 1 3	15/6	14/3
Veritys	5/-	6/-	+9d	12½	12½	10 8 6	6/9	5/3
Walsall Conduits	4/-	12/-		20	20	6 13 3	12/-	11/-
Ward & Goldstone	5/-	25/-	+1/6	35	40	4 0 0*	25/3	23/6
Watford	2/-	6/9		25	25	7 8 3	6/9	5/-
Westinghouse	£1	38/9	+1/3	18	10*	5 3 3	38/9	32/3
West, Allen	5/-	10/3	+6d	15	12½*	6 2 0	10/3	9/3
Wolf Electric	5/-	7/-		20	10*	7 2 9	9/-	7/-

Dividends Declared

Good figures in the preliminary statement of the 1957 results of Automatic Telephone & Electric were reflected in a rise of 1s 9d in the price of the £1 shares, to 66s 3d. There is no change in the rate of 17 per cent to which the dividend was raised a year ago. It involves the distribution of less than one-third of the available surplus, the net group profit having expanded by about 15 per cent to £1·1 million. Chloride Electrical Storage are also paying the same dividend as before—a total of 17½ per cent—but from reduced profits, and the £1 "A" shares were lowered by 3s 3d to 58s 9d. Allen West's single annual payment of 12½ per cent applies to capital increased since last year's by a 30 per cent scrip issue, and represents an improvement equivalent to about 1 per cent.

Profits Tax

Results of some interest emerge from calculations about the extent to which individual companies may be affected by the Chancellor's decision to replace with a single flat rate of 10 per cent the former dual profits tax of 3 per cent on undistributed and 30 per cent on distributed profits. Only in extreme cases, however, is the change thought likely to produce differences large enough to have much influence on board room decisions on dividend policy. As a rough guide, the company which customarily retains in its business about two-thirds of its net surplus of earnings appears to be unaffected by the change. Other things being equal, firms which retain a smaller proportion should in future pay rather less profits tax, and the converse applies to the most conservative dividend payers.

Effect on Earnings

Calculations by a firm of Stock Exchange dealers in electrical shares bear out the proposition that where a dividend is covered three times over (or a fraction more) by the company's distributable earnings the change in the basis of the profits tax alters the liability very little. Cases on or about this line appear to include, for instance, Crompton Parkinson, Thorn Electrical, Babcock & Wilcox, and Reyrolle. For A.E.I., on which the last dividend was covered about 1½ times, the change is calculated to add the equivalent of 3½ per cent to earnings. A 2½ per cent increase is indicated for English Electric. For very conservative dividend payers, such as Ward & Goldstone, Clarke Chapman, and Simon-Carves, the extra cost is estimated to reduce earnings by 4 to 7 per cent. In the majority of the calculations, the difference is seldom more than one or two per cent either way. The figures are of course given very tentatively, subject to a number of variable factors.

REPORTS and DIVIDENDS

A. Reyrolle & Co., Ltd.—The report and accounts for 1957 now issued confirm the preliminary figures given in our issue of 11th April. In his statement, which is circulated with the report and accounts, Sir Claude Gibb (chairman) says that the value of orders received in 1957 created a new record, and as these orders were spread over the entire range of switchgear, a well-balanced production was obtained and the output exceeded that of the previous year. Among the more important orders in the home market were the 132 kV main switchgear for Bradwell nuclear power station, 275 kV switchgear for West Thurrock power station, 132 kV indoor switchgear for Rugeley power station, and 110 kV switchgear for Northern Ireland.

The tonnage shipped overseas was a record, to which increased sales of small oil volume circuit-breakers made a substantial contribution. The company secured the switchgear contracts for two power stations overseas of particular note. They are for the Athlone power station of the Capetown Corporation, and for the Wairakei geothermal power station of the New Zealand Government. The development of new designs and the improved facilities in the new light engineering shop are reflected in the substantial volume of work for overseas on protective equipment for 132 kV, 275 kV and 330 kV transmission systems. Orders in hand include equipment for the Federal Hydro Board of Rhodesia's Kariba scheme, the Snowy Mountains Hydro-Electric Authority's development in Australia, and for extensions of the high voltage system of the Electricity Commission of South Africa.

Orders for standard switchgear from the Area Electricity Boards, National Coal Board, United Kingdom Atomic Energy Authority, oil companies, and other industrial undertakings continued at a high level, and there was a satisfactory demand for the latest designs of 33 kV metalclad switchgear and a new range of outdoor rural switchgear of standardised construction. The development of the air-break circuit-breaker has been taken an important stage further and covers voltages from 400 V to 11 kV.

Referring to the Nuclear Power Plant Co., Ltd., of which Reyrolle is a member company, Sir Claude says that good progress is being made with the Bradwell nuclear power station, and the Nuclear Power Plant Co. has made the first arrangement for the sale of industrial nuclear power plant abroad. This is for the construction of nuclear power plant in Italy. With regard to their interest in Anglo Great Lakes Corporation, Ltd., which is building a factory at Newburn-on-Tyne to manufacture graphite for reactors, this factory should be sufficiently established in the latter half of 1958 to start deliveries to the United Kingdom Atomic Energy Authority; Reyrolle's are to machine the graphite moderator bricks. A major extension of several bays to one of the shops at the Hebburn works has been completed and the extension of the research laboratories will be in full use by the end of 1958.

Desoutter Brothers (Holdings), Ltd.—The main figures for 1957 were given in our issue of 28th March. In his review of the year, Mr. G. H. Webb (chairman and managing director) says that the year under review proved to be a difficult one. Sales, however, in all departments of the subsidiary companies have risen a little over the previous year, although exports generally show a slightly lower figure. The first part of the company's programme of extensions to factories has now been completed, and the directors have considered it prudent to delay their plans for further extensions until such time as the effects of capital restrictions and foreign import difficulties are more clearly defined. After referring to the acquisition of a 76 per cent interest in Lang Pneumatic, Ltd., Wolverhampton, Mr. Webb says that the general experience in the machine tool industry is for order books to be somewhat lower than at this time last year. This experience is being shared by their companies, although current orders continue to keep their productive capacity fully employed. The design, research and experimental staffs of both subsidiary companies are fully engaged upon new developments which he anticipates will increase the demand for their products.

Enfield Cables, Ltd.—In the course of his review of 1957 Mr. H. J. Randall (chairman) says that the group profit, before tax, has increased from £12,105 in 1956 to £90,670 last year. Losses sustained through the severe fall in commodity prices amounted to £85,000 in 1956 and £130,000 in 1957, while the profit from cable making increased from £97,000 to £220,000. Commenting on the losses on price fluctuations, Mr. Randall says that they arose because many cables had to be made for stock, and a fall in price occurred between the times when the materials were bought and when the cables were sold. Most of the losses on price fluctuations arose on copper and lead, but rubber also fell in price and caused a small loss. The prices at the beginning of 1958 are generally thought to be extremely low and to leave no room for further falls. If this view proves to be correct then the company should not incur further stock losses. However, to guard against that possibility they have set aside, by transfer to general reserve, the sum of £75,000 to cover possible future losses on price fluctuations.

The new technical laboratory and the extension to the paper cable factory are now almost completed and ready for installation of equipment. They believe that they will shortly have the most modern high-voltage cable laboratory in the country and the manufacturing facilities that must go with it. At the present time their order book is about the same in volume as it was at this time last year although it is different in composition. There is a marked reduction in telephone cable business but an increase in orders for supervoltage cables.

The cable industry is in a period of technological change involving the increasing use of the many types of thermoplastic material and the corresponding necessity to switch production from the traditional machinery to quite different plant. They believe they have put themselves in a position to meet this change. In Mr. Randall's opinion 1958 and certainly immediately succeeding years will see a startling change from the traditional rubber and paper insulated cables to plastic cables.

The London Electric Wire Co. & Smiths, Ltd.—The trading profit for 1957 amounts to £775,632, as compared with £1,015,441 for 1956, and after providing £287,686 for taxation, and meeting other charges, the net balance is £437,946 (against £531,257). General reserve receives £230,000 and the ordinary dividend for the year is maintained at 12½ per cent, with a final payment of 8¾ per cent. The balance carried forward is £503,236 (against £494,299 brought in).

The directors state that arising from a sharp fall in copper prices during the year, stock depreciation of approximately £305,000 was incurred, of which approximately £193,000 was covered by existing provision for stabilisation of commodity prices and the balance of £112,000 has been charged in arriving at group profits.

British Insulated Callender's Cables, Ltd.—The preliminary statement for 1957 shows a surplus on trading of £7,832,872, as compared with £9,445,363 for 1956. It is stated that although the volume of turnover was fully maintained, profits for 1957 were adversely affected by lower profit rates, the dislocation caused by major re-planning and re-equipment schemes, and the effects of the substantial falls in the price of copper. After meeting all charges, including £3,002,202 for taxation, the group net profit is £2,479,080 (against £3,639,009), to which is added taxation adjustments of £220,126 and other items, making £2,670,051, of which £2,485,977 is applicable to the holding company. Capital reserves receive £28,608 and revenue reserves £1,190,595. It is proposed to pay a final dividend on the ordinary capital of 8½ per cent, again making 12½ per cent for the year,

and £141,078 is added to the surplus carried forward.

The Automatic Telephone & Electric Co., Ltd., reports a group profit for 1957 of £1,981,905, as compared with £1,794,081 for the preceding year, and after meeting taxation charges, the net profit is £1,139,144 (against £988,146), of which £170,738 is retained in subsidiaries. Revenue reserves receive £467,359 and a special appropriation of £250,000 is made for scientific research. It is proposed to pay a final ordinary dividend of 10 per cent and a bonus of 2 per cent, maintaining the distribution for the year on the ordinary and deferred capital at 17 per cent. The group carry-forward is £1,000,249 (against £1,017,300 brought in).

The Telegraph Construction & Maintenance Co., Ltd.—Preliminary figures for 1957 show that after deducting £375,947 for taxation and £241,208 for depreciation, the group net profits are £250,327, as compared with £215,670 for the preceding year. The dividend for the year is maintained at 7½ per cent, with a final payment of 3¾ per cent, but the board is raising the bonus payment from 1 per cent to 2½ per cent. This increased payment arises from special circumstances which are peculiar to the year, large tax credits related to past years, totalling £276,621 (against £21,187), having been brought into the accounts.

The Chloride Electrical Storage Co., Ltd.—The profits for 1957 amount to £756,231, as compared with £1,032,406 for 1956, to which is added profits relating to previous years of £209,874. A second interim dividend of 12½ per cent is paid on the "A" and "B" ordinary stock, making 17½ per cent (unchanged) for the year. No further dividend for the year will be recommended.

W. Canning & Co., Ltd.—After transferring £33,574 to reserve to meet the increased cost of replacement of fixed assets, the profit for 1957 is £606,350, as compared with £589,530 for the previous year. Taxation absorbs £358,477 and the net profit is £247,873 (against £263,629). General reserve again receives £150,000 and it is proposed to pay a final dividend of 20 per cent, again making 25 per cent for the year. In addition 2¼ per cent, tax free, is distributed out of capital profits.

Thomas Bolton & Co., Ltd.—The accounts of this company were dealt with in our issue of 28th February. Mr. F. Waine (chairman) presided at the annual meeting held on 16th April. In his review of the year, which had been previously circulated, Mr. Waine said that the reduction in the trading profit was due to the pressure of more competitive conditions, increases in costs not recovered in selling prices, and more especially to the reduced volume and profitability of the sales of sulphate of copper. As the value of the copper content in sales represented almost 70 per cent of the total, the very considerable fall in copper prices over the last two years had resulted in an appreciable reduction in total sales in 1957 as compared with 1956. In metal products, however, tonnage invoiced had been well maintained but, on the other hand, the sale of sulphate of copper showed a substantial reduction. After referring to the falling prices of copper, Mr. Waine said that while prices of the principal alloying metals utilised in their manufacturing operations followed the same trend as those of copper, other items of costs, such as wages, fuel, and transport charges, had more than balanced the advantages obtained from these lower material costs. It must be appreciated that there was a changing demand for certain of their traditional products, but having full regard to this, they were developing alternative outlets, without changing the essential character of their operations. Research and development had continued at a steady level of activity.

The British Engine Boiler & Electrical Insurance Co., Ltd., reports a net profit for 1957 of £142,612, as compared with £76,200 for the previous year. General reserve receives £250,000 and it is proposed to pay a final dividend of 40 per cent, making 75 per cent for the year (against 65 per cent). The balance carried forward is £237,678 (against £405,225 brought in).

The British Aluminium Co., Ltd., proposes, in order to provide a greater reserve of unissued ordinary capital against any possible requirements, to increase the authorised capital from £12 million to £15 million by the creation of new ordinary shares. It is also proposed that the existing 500,000 unissued preference shares shall become unissued ordinary shares. There is no intention to issue any further capital at the present time.

The National Electric Construction Co., Ltd.—After taxation of £84,386 and minority interests of £87,178, the group net profit for 1957 is £99,061 (against £97,255 for 1956), and the net profit of the parent company is £83,633 (£79,296). The dividend for the year is unchanged at 17½ per cent.

Edwards High Vacuum, Ltd.—After deducting £103,178 for taxation the consolidated net profit for 1957 is £76,458, as against £85,039 for 1956. The final dividend is 11 per cent, making 15 per cent for the year (unchanged).

Hopkinsons, Ltd., report a group net profit for the year ended 31st January last of £526,216, as compared with £422,845 for the preceding year. The figure is struck after providing £495,150 for taxation. The profit attributable to the holding company is £493,454. General reserve receives £300,000 and plant replacement reserve £51,245. It is proposed to pay a final dividend of 22½ per cent (against 20 per cent), making 32½ per cent (30 per cent) for the year.

Wm. Sanders & Co. (Wednesbury), Ltd.—The profit for 1957, before tax of £20,475, is £34,809, as compared with £30,168 for 1956. The dividend for the year is maintained at 20 per cent.

Allen West & Co., Ltd., report a group profit for the year ended 31st January last, after meeting all charges, including £567,186 for taxation, of £483,275, as compared with £500,062 for the previous year, of which £482,635 is attributable to the parent company. General reserve receives £250,000 and it is proposed to pay a dividend of 12½ per cent for the year on capital of £2,281,500 (against 15 per cent on £1,755,000).

New Companies

Express Transformers & Controls, Ltd.—Registered 3rd April. Capital £5,000. To acquire the business of transformer manufacturers and repairers and general engineers carried on at Croydon as Express Winding Co., etc. Directors: R. J. Bridger and T. Gallacher. Regd. office: 44/46, Beddington Lane, Croydon.

Dulwich Electrical Supplies, Ltd.—Registered 15th April. Capital £1,000. Electrical, radio, television and refrigeration engineers and contractors, etc. Directors: H. G. T. Cole, R. J. Weedon and R. F. Hollamby. Regd. office: Winchester House, 19, Bedford Row, W.C.1.

John Barvel, Ltd.—Registered 15th April. Capital £1,000. Manufacturers of and dealers in artificial lighting apparatus, electrical plant, radio and television sets, etc. Directors: A. A. Baird and T. E. Veal. Regd. office: 53, Oakbank Road, Woolston, Southampton.

John Brett and Partners (Electrical), Ltd.—Registered 28th March. Capital £1,000. Electrical engineers and contractors, etc. Directors: J. F. Brett, E. Stewart and R. H. Harper. Regd. office: 303, Chiswick High Road, W.4.

Tim Smith, Ltd.—Registered 28th March. Capital £1,000. Electricians, electrical contractors, etc. Directors: E. H. Smith, Miss Christina W. Harman and Miss Rosemarie T. Harman. Regd. office: 51, St. Mary's Road, Southampton.

Clive Courtenay & Co. (Consultants), Ltd.—Registered 3rd April. Capital £1,000. Electronic experts and consultants, manufacturers of and dealers in telecommunication equipment, inter-communication systems, etc. Directors: C. L. Lacey and G. B. Johnson. Regd. office: 9, Cavendish Square, W.1.

Correctone, Ltd.—Registered 27th March. Capital £2,000. Designers, manufacturers of and dealers in all kinds of electronic, electrical equipment, etc. Directors: E. H. E. Giles and G. R. Fry. Regd. office: 9, Clarges Street, W.1.

Jarvis Rowell & Co., Ltd.—Registered 28th March. Capital £4,000. To acquire the business of sound and electrical engineers and contractors now carried on by A. E. Jarvis and G. E. Rowell as Jarvis & Rowell. Directors: A. E. Jarvis, Mrs. Dorothy M. Jarvis, G. E. Rowell and Mrs. Eva M. Rowell. Regd. office: Burnham Road, Dartford, Kent.

R. Clark (Electrical Contractors), Ltd.—Registered 28th March. Capital £3,500. Manufacturers of and dealers in radio and television sets and equipment, etc. Directors: R. Clark and G. Clark. Regd. office: 22a, Bedford Road, Barton-le-Cley, Beds.

Robinson & Hill (Electrical), Ltd.—Registered 1st April. Capital £2,000. Electrical engineers, etc. Directors: N. F. Robinson and

FINANCIAL SECTION (*continued*)

H. Hill. Regd. office: 113, Adderley Road, Saltley, Birmingham.

A. F. Kershaw (Blackpool), Ltd.—Registered 1st April. Capital £1,000. Electrical, mechanical, radio, television, telephone, lighting, heating, motor and general engineers, etc. Directors: A. F. Kershaw and Mrs. Elizabeth J. Kershaw. Regd. office: Palatine Buildings, Adelaide Place, Blackpool.

Industrial Electrical Contractors (Beds & Herts), Ltd.—Registered 1st April. Capital £2,000. Electrical engineers, wiring contractors, etc. Solicitors: Waltons, 35/37, King Street, Luton.

Rex Morris, Ltd.—Registered 2nd April. Capital £100. Manufacturers of and dealers in radio and television sets, etc. Directors: R. Morris and Marjorie Morris. Regd. office: 100, Cowbridge Road East, Cardiff.

J. H. May (Electrical), Ltd.—Registered 1st April. Capital £2,000. Electricians, mechanical engineers, manufacturers of and dealers in electrical apparatus and goods, radio and television sets, etc. Directors: J. H. May and Margaret A. May. Regd. office: 48, Harborough Road, Rushden.

R.G.R. Electrical, Ltd.—Registered 31st March. Capital £500. Manufacturers of and dealers in washing machines and cleaners, dynamos, motors, etc. Directors: A. F. Glover, F. J. Russell and K. N. G. Robinson. Regd. office: 10, Harmer Street, Gravesend, Kent.

M. & T. Doyle Electrical Engineers, Ltd.—Registered 2nd April. Capital £1,000. Directors: T. Doyle and M. R. Doyle. Regd. office: 22, George Street, Croydon, Surrey.

Hepworth & Co. (Ashton), Ltd.—Registered 3rd April. Capital £1,000. Electrical, motor armature winders, rewinders and repairers, electrical motor manufacturers and repairers, etc. Directors: R. H. Bishop and Vera G. Bishop. Regd. office: 18, Lloyd Street, Manchester, 2.

F.G.L. (Construction), Ltd.—Registered 8th April. Capital £1,000. Electrical lighting, heating, radio, television, mechanical and general engineers, etc. Directors: Annie Durant and C. M. Durant. Regd. office: 42a, Frederick Street, Birmingham, 1.

W. Turner & Co. (Engineers), Ltd.—Registered 8th April. Capital £100. Manufacturers and repairers of and dealers in electrical plant, machinery, etc. Directors: W. Turner, Frances L. Turner and J. R. Moss. Regd. office: 85, St. Petersgate, Stockport.

Gresham Developments, Ltd.—Registered 8th April. Capital £1,000. Development engineers, designers, manufacturers of and dealers in electrical, electro-magnetic and electro-mechanical equipment for automatic control purposes, etc. Directors: J. A. Clegg and C. B. Speedy. Regd. office: 50, Gresham House, Old Broad Street, E.C.2.

Hardy & Roberts, Ltd.—Registered 10th April. Capital £500. Electrical engineers and contractors, manufacturers of and dealers in radio apparatus, etc. Directors: A. J. Hardy, Mrs. Mary Hardy and Mrs. Brenda Roberts. Regd. office: Manchester House, Owston Road, Carcroft.

Orthic Images, Ltd.—Registered 11th April. Capital £100. Electrical engineers and contractors, etc. H. A. G. Holmes is the first director. Regd. office: 82, Portland Place, W.1.

Grinding & Electrical Installation Co., Ltd.—Registered 14th April. Capital £500. Electrical, mechanical, radio, television, heating, motor and general engineers, etc. Directors: Mary E. Lock and H. Morton. Regd. office: 13, King Street, Sutton-in-Ashfield.

Russells (Hinckley), Ltd.—Registered 10th April. Capital £6,000. Manufacturers of and dealers in radio, electrical and mechanical apparatus, etc. Directors: L. L. Payne, Mary A. Payne, C. L. Payne and Doris Payne. Regd. office: 56½ Castle Street, Hinckley.

Enfields (Frome), Ltd.—Registered 11th April. Capital £15,000. Designers, manufacturers, hirers of and dealers in radio, television and telephone apparatus, etc. Directors: H. E. Enfield and R. H. Perrett. Regd. office: 19, Catherine Hill, Frome.

Enfields (Midsomer Norton), Ltd.—Registered 11th April. Capital £17,000. Designers, manufacturers, hirers of and dealers in radio, television and telephone apparatus, etc. Directors: H. E. Enfield and H. F. Gregory. Regd. office: 77, High Street, Midsomer Norton, nr. Bath.

Enfields (Radstock), Ltd.—Registered 11th April. Capital £5,000. Designers, manufacturers, hirers of and dealers in radio, television and telephone apparatus, etc. Directors: H. E. Enfield and C. B. Baynton. Regd. office: Fortescue Road, Radstock, nr. Bath.

Baker Reproducers, Ltd.—Registered 8th April. Capital £100. Inventors, designers and manufacturers of and dealers in scientific and industrial instruments for laboratory and industrial use, dynamos, electric motors, loudspeakers, acoustical equipment and electronic devices, etc. Directors: E. W. Coppard and Mrs. Pamela E. Coppard. Regd. office: 24, Dingwall Road, Croydon, Surrey.

Hulme & Howell, Ltd.—Registered 9th April. Capital £100. Consultants, research, development, design, manufacturing and sales engineers, contractors, dealers and agents in all kinds of electronic, electrical, electro-mechanical and mechanical techniques and equipment, etc. Directors: P. H. Walker and R. T. A. Howell. Regd. office: 197 Kings Road, Kingston-on-Thames.

Michael Neidle, Ltd.—Registered 9th April. Capital £100. Electrical engineers and contractors, manufacturers, importers and exporters of and dealers in radio apparatus, etc. Directors: M. Neidle and C. V. Shaw. Regd. office: 46, Blandford Street, W.1.

Liquidation

Electric Utilities, Ltd. (in voluntary liquidation).—Meeting of members on 12th May at 45, Wick Lane, Christchurch, Hants, to receive an account of the winding-up by the liquidator, Mr. A. S. Holmes.

Bankruptcies

J. J. Glover, 24, Mark Place, Reading, electrical contractor.—Supplemental dividend of 5s 9¼d in the £, payable at 58-61, York Terrace, Regent's Park, London, N.W.1.

T. A. Flowers, residing and lately carrying on business at 20, Riversdale Road, West Cross, Swansea, electrical contractor and sales representative.—Receiving order made 10th April on debtor's own petition.

NEXT WEEK'S EVENTS

Organisers of electrical functions are advised to make use of the "Electrical Review" clearing house, Room 221, Dorset House, Stamford Street, London, S.E.1, to ascertain that proposed dates for their functions do not clash with others already arranged.

Monday, 28th April

BIRMINGHAM.—James Watt Memorial Institute, Great Charles Street, 6 p.m. I.E.E. South Midland Radio and Measurements Group. "Servo-Operated Recording Instruments (A Review of Progress)," by Dr. A. J. Maddock.

LEEDS.—The University, 7.30 p.m. Incorporated Plant Engineers, West and East Yorkshire Branch. "The Raising of the Hoenfells," by A. T. Bride.

LONDON.—2, Savoy Place, W.C.2, 5.30 p.m. I.E.E. Radio and Telecommunication Section. "Economic Usage of Broad-Band Transmission Systems," by R. J. Halsey.

Monday, 28th April, to Friday, 2nd May

LONDON.—Church House, Great Smith Street, S.W.1. Institute of Metals. Golden Jubilee meeting.

Tuesday, 29th April

CARDIFF.—Angel Hotel, Westgate Street, 7.30 p.m. A.S.E.E. South Wales Branch. Film evening.

EDINBURGH.—Carlton Hotel, North Bridge, 7 p.m. I.E.E. South-East Scotland Sub-Centre. Annual general meeting.

LEEDS.—C.E.G.B. Offices, Whitehall Road. I.E.E. North Midland Centre Utilisation Group. "Electricity in Modern Commercial Horticulture," by C. A. Cameron-Brown and A. W. Gray.

LONDON.—2, Savoy Place, W.C.2. 5.30 p.m. I.E.E. Measurement and Supply Sections. "Generator Rotor-Angle Measurement and Display," by J. N. Prewett; "Generator Rotor-Angle Measurement by Stroboscopic Means," by E. B. Powell and M. E. Harper, and "System Phase-Angle Measurements," by F. Moran.

21, Bloomsbury Street, W.C.1. Society of Relay Engineers. 11.30 a.m. Annual general meeting. 2.30 p.m. Lecture and demonstration, "Television Relay with Particular Reference to the BRW Mk.11 Television Relay Equipment," by K. A. Russell.

MANCHESTER. — Engineers' Club, Albert Square, 7.30 p.m. Junior Institution of Engineers, North Western Section. "The Origin and Function of R.E.M.E.", by Major General W. A. Lord.

NEWCASTLE-UPON-TYNE. — Crown Hotel, Clayton Street West, 7.30 p.m. A.S.E.E. Tyneside Branch. "An Introduction to Electrical Floor Warming," by R. Bradbury.

Tuesday, 29th April, to Thursday, 1st May

EDINBURGH.—Music Hall and Assembly Rooms. Electrical Association for Women. Annual conference.

Wednesday, 30th April

CHIPPENHAM.—At the Westinghouse Brake & Signal Co., 6.30 p.m. I.E.E. Bristol Graduate and Student Section. "Transistors in Switching Circuits," by M. Paskins.

ISLE OF GRAIN.—Oil Refinery, 2 p.m. E.I.B.A. Kent Branch. Annual general meeting, followed by tour of the refinery and tea.

LONDON.—2, Savoy Place, W.C.2, 5.30 p.m. I.E.E. Supply Section. "The Design of a 330 kV Transmission System from Rhodesia," by F. C. Winfield, T. W. Wilcox and G. Lyon.

Connaught Rooms, W.C.2, 12.30 for 12.55 p.m. Batti-Wallahs' Society. Luncheon. Guest speaker, Sir Miles Thomas.

MANCHESTER.—Engineers' Club, 2.30 p.m. Combustion Engineering Association, North Western Region. "Utilisation of Small Coals," by G. Doxey.

NEWCASTLE-UPON-TYNE.—The Royal Station Hotel, 10.30 a.m. Combustion Engineering Association, Northern Region. "The Removal of Dust and Grit from Boiler Plant Effluents," by Dr. C. J. Stairmand.

NORTHAMPTON. — College of Technology, 7.15 p.m. Northampton and District Electrical Association. Annual general meeting.

STAFFORD.—Technical College, 7.15 p.m. I.E.E. North Staffs. Graduate and Student Section. Annual general meeting.

Thursday, 1st May

LONDON.—Savoy Hotel, W.C.2, 7 for 7.30 p.m. British Institution of Radio Engineers. Annual dinner.

NOTTINGHAM. — Demonstration Theatre, East Midlands Electricity Board, Smithy Row, 6 p.m. I.E.S. Nottingham Centre. Annual general meeting.

SOUTHAMPTON. — Pilgrim Room, Polygon Hotel, 8 p.m. A.S.E.E. Southampton Branch. "New Light in Industry," by W. Robinson.

Friday, 2nd May

BRISTOL.—Grand Hotel, Broad Street, 8 p.m. A.S.E.E. Bristol and West of England Branch. "Industrial Electronics."

LIVERPOOL.—9, The Temple, 24, Dale Street, 7.30 p.m. A.S.E.E. Liverpool Branch. "The Television Receiver," by J. W. Driscoll.

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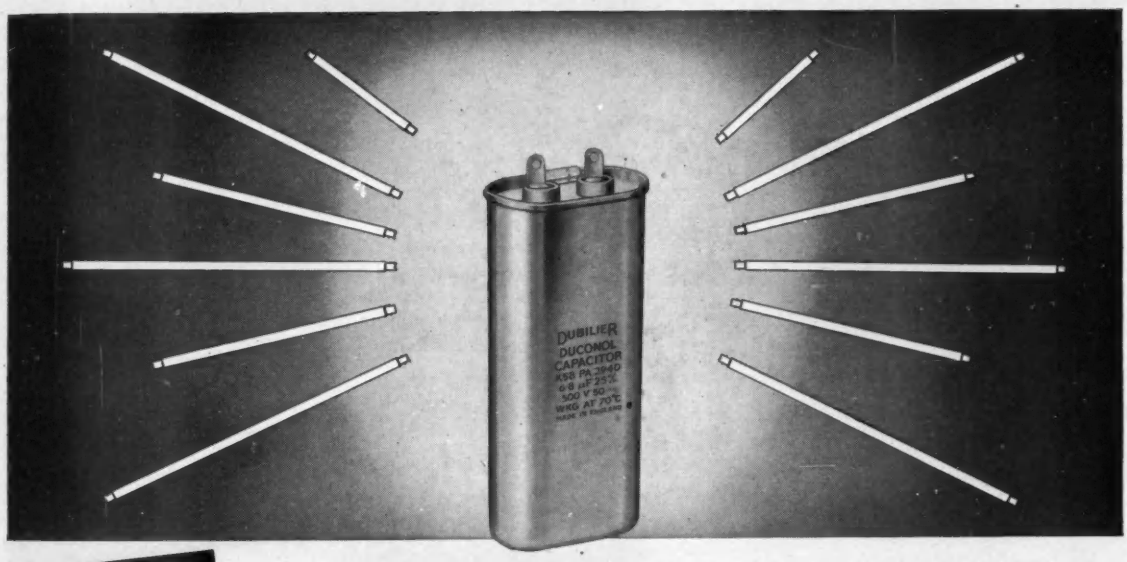

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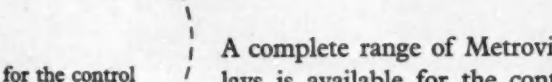

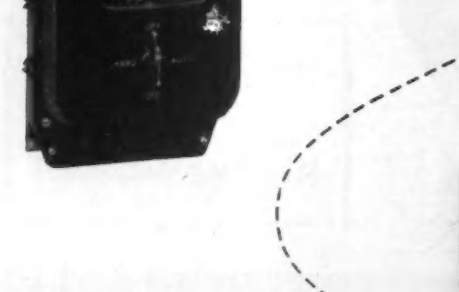

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NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (3s 6d each including postage) will be obtainable after 30th April from the Patent Office, 25, Southampton Buildings, London, W.C.2

1953

22096. Electric & Musical Industries, Ltd. —Photo-conductive targets and especially television pick-up tubes and analogous image pick-up tubes. 11th August, 1954. (794331.)

29687. Simplex Dairy Equipment Co., Ltd. —Electrical control apparatus for milking apparatus. 26th January, 1955. (794182.)

1954

2118. Creed & Co., Ltd.—Printing telegraph apparatus. 21st January, 1955. (Cognate application 4872, 19th February, 1954.) (794091.)

13272. Elliott Bros. (London), Ltd.—Overload protection devices for d.c. electrical measuring instruments. 8th August, 1955. (794256.)

14168. National Research Development Corporation.—Cathode-ray tubes. 14th May, 1954. (794257.)

15673. Berghaus, B.—Process for carrying out technical processes by glow discharges. 27th May, 1954. (794174.)

16531. French & Sons, Ltd., T., Stephenson, M., and Peace, T. E.—Electrical heating elements. 3rd June, 1955. (794186.)

21448. Centre d'Etudes et de Developpements de l'Electronique Cedel.—Unidirectionally conducting elements. 22nd July, 1954. (794025.)

21601. Nielsen Co., Ltd., A. C.—Apparatus for determining the transmitting station to which a radio receiver is tuned. 23rd July, 1954. (794342.)

23085. Eitel-McCullough, Inc.—Velocity modulated electron tubes. 9th August, 1954. (794333.)

24498. General Electric Co., Ltd., and Plummer, A. R. F.—Transistors. 23rd November, 1955. (794189.)

24499. General Electric Co., Ltd., Bridges, D. H., and Jones, D. D.—Detectors for physical phenomena. 23rd November, 1955. (794258.)

25845. Staatsbedrijf der Posterijen, Telegrafie en Telefonie.—Electronic counting circuit. 6th September, 1954. (794190.)

26774. British Thomson-Houston Co., Ltd.—Circuit arrangements for operating electric discharge lamps. 15th September, 1954. (794028.)

28336. English Electric Co., Ltd.—Electric switches. 23rd September, 1955. (794191.)

28370. Associated Electrical Industries, Ltd.—Electron optical lens systems. 29th November, 1955. (Cognate application 34973, 2nd December, 1954.) (794014.)

28881. Foster Transformers, Ltd., and Jennings, R. E.—Earth leakage protective devices. 3rd October, 1955. (794106.)

33078. Philips Electrical Industries, Ltd. —Multiplex signalling systems. 15th November, 1954. (794031.)

34824. Sunvic Controls, Ltd.—Electronic calculating apparatus. 20th December, 1955. (794109.)

35315. Siemens-Schuckertwerke Akt.-Ges. —Dry rectifiers. 6th December, 1954. (794194.)

37473. Igranic Electric Co., Ltd.—Hermetically sealed electrical switching devices, particularly electromagnetic contactors. 28th December, 1954. (794110.)

1955

2128. Soc. Nouvelle de l'Outillage R.B.V. et de la Radio-Industrie.—Television transmitters. 24th January, 1955. (794348.)

2699. Associated Electrical Industries, Ltd.—Apparatus for focusing electron beams. 2nd February, 1956. (794015.)

3368. Westinghouse Brake & Signal Co., Ltd., and Cooper, G.—Dry contact rectifiers. 5th January, 1956. (794196.)

7092. Vokes, Ltd.—Electrostatic gas-filters. 7th March, 1956. (794038.)

8817. Coal Industry (Patents), Ltd.—Electrically driven pumps. 18th June, 1956. (794039.)

9216. Electric & Musical Industries, Ltd. —Television and like pick-up tube arrangements. 28th March, 1956. (794200.)

10987. Powers-Samas Accounting Machines, Ltd.—Electronic counters. 22nd March, 1956. (794117.)

11106. Eitel-McCullough, Inc.—Beam type electron tube apparatus. 18th April, 1955. (794334.)

11681. Sperry Gyroscope Co., Ltd.—Constant frequency a.c. generators. 16th April, 1956. (794203.)

12044. Metropolitan-Vickers Electrical Co., Ltd.—Electric circuit-breakers. 25th April, 1956. (794204.)

12512. Standard Telephones & Cables, Ltd.—Stepping circuit arrangement using trigger devices. 29th April, 1955. (Addition to 727415.) (794040.)

13128. C.J.R. Electrical & Electronic Development, Ltd., and Banks, C. H.—Electric supply systems for portable electric tools. 30th April, 1956. (794120.)

13285. Telefunken Ges.—Electric discharge devices. 9th May, 1955. (794041.)

14996. Industrial Nucleonics Corporation. —Electromagnetic radiation devices. 24th May, 1955. (794207.)

17984. Smit & Co.'s Transformatorenfabriek N.V., W.—Tap changing switches. 21st June, 1955. (794267.)

18346. Standard Telephones & Cables, Ltd.—Recording equipment for electrical signals. 24th June, 1955. (794126.)

20419. Siemens-Halske Akt.-Ges.—Electron microscopes. 14th July, 1955. (794356.)

22020. British Thomson-Houston Co., Ltd.—Pumping apparatus. 31st July, 1956. (794048.)

22485. General Electric Co., Ltd.—Methods of forming a junction in a semi-conductor. 3rd August, 1956. (794128.)

22673. General Electric Co., Ltd.—Reflectors and electric fires. 30th July, 1956. (794270.)

25638. Philips Electrical Industries, Ltd. —Electric switching devices comprising one or more push-buttons. 7th September, 1955. (794055.)

28676. Aerovox Corporation.—Electric capacitor and method for producing same. 7th October, 1955. (794056.)

30178. Compagnie Industrielle des Ceramiques Electroniques.—Thermistors and processes of manufacturing same. 21st October, 1955. (794058.)

33283. General Electric Co.—Protective systems for electric transmission lines. 21st November, 1955. (794134.)

34171. General Electric Co.—Protective systems for electric transmission lines. 29th November, 1955. (Addition to 794134.) (794370.)

37453. General Electric Co.—Printed electrical circuits. 30th December, 1955. (794020.)

37484. Siemens & Halske Akt.-Ges.—Circuits for measuring the minimum amplitude of modulated waves. 30th December, 1955. (794284.)

1956

447. General Electric Co., Ltd.—Low pressure mercury vapour electric discharge lamps. 12th November, 1956. (794285.)

666. Lorenzen, J. F.—Apparatus for the photo-electric sensing of symbols and figures. 9th January, 1956. (794139.)

2034. Pommeret, H. L. E.—Magneto-electric system. 20th January, 1956. (794068.)

3086. Stichting Reactor Centrum Nederland.—Process for effecting nuclear fission reactions. 31st January, 1956. (Addition to 755495.) (794224.)

5025. General Electric Co.—Systems for controlling parallel circuits supplying a common load. 17th February, 1956. (Addition to 793278.) (794070.)

7456. Western Electric Co., Inc.—Electrical information storage systems. 9th March, 1956. (794144.)

7671. I-T-E Circuit Breaker Co.—Current transformer. 12th March, 1956. (794225.)

10031. Sperry Rand Corporation.—Electrical data transmission systems. 29th March, 1956. (794076.)

10685. Hadley Telephone & Sound Systems, Ltd.—Reversible electromagnetic indicative counter. 8th April, 1957. (794228.)

11792. Western Electric Co., Inc.—Electrical equaliser circuits. 18th April, 1956. (794078.)

11823. General Motors Corporation.—Control system for electric heater elements. 18th April, 1956. (794391.)

12975. Standard Telephones & Cables, Ltd.—Electric current rectifier. 27th April, 1956. (794230.)

14068. Philips Electrical Industries, Ltd. —Methods of manufacturing indirectly heated cathodes. 7th May, 1956. (794154.)

15567. Standard Telephones & Cables, Ltd.—Electroluminescent image convertor. 18th May, 1956. (794232.)

17767. Westinghouse Electric International Co.—Single-phase electric motors and control means therefor. 8th June, 1956. (794082.)

19243. Gaylord Products, Inc.—Speed responsive electric switches. 21st June, 1956. (794309.)

19781. Sylvania Electric Products, Inc.—Bulb rolling machine. 26th June, 1956. (794310.)

20396. Westinghouse Electric International Co.—Electric motor control systems. 2nd July, 1956. (Addition to 721084.) (794313.)

22959. Standard Telephones & Cables, Ltd.—Loudspeaker intercommunication systems. 25th July, 1956. (Addition to 770937.) (794162.)

25958. Standard Telephones & Cables, Ltd. (International Telephone & Telegraph Corporation).—Travelling wave electron discharge devices. 24th August, 1956. (794084.)

26912. Masón, O.—Electrical connectors and more particularly to ceiling roses. 3rd September, 1956. (Addition to 787713.) (794244.)

27222. Telefonaktiebolaget L. M. Ericsson.—Electron tubes. 5th September, 1956. (794324.)

28516. Montecatini Soc. Générale per l'Industria Mineraria E. Chimica.—Electric cable joint sealing members. 18th September, 1956. (794326.)

28658. Telefonaktiebolaget L. M. Ericsson.—Telephone dial mechanisms. 19th September, 1956. (794247.)

1957

295. General Electric Co.—Method and apparatus for making printed circuits. 3rd January, 1957. (Addition to 794020.) (794021.)

2751. Babcock & Wilcox, Ltd.—Nuclear reactors and an improved method of operating nuclear reactors. 25th January, 1957. (794329.)

29574. Electric & Musical Industries, Ltd. —Photo-conductive targets and especially television pick-up tubes and analogous image pick-up devices. 11th August, 1954. (Divided out of 794331.) (794332.)

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Australia.—Electricity Commission of New South Wales, Sydney. 26th May. Coal handling plant at Tallawarra power station. (E.S.B. 9437/58. Ten/31971.)*

Postmaster General's Department, Melbourne. 29th May. Carrier loading coils. (E.S.B. 9007/58. Ten/31881.)* 3rd June. Jointing material for p.v.c. and sheathed cable. (E.S.B. 9005/58. Ten/31879.)*

Bedford.—R.D.C. 2nd June. Two sets of electrically-driven sewage pumps, together with equipment, for Eaton Socon drainage. John Taylor & Sons, engineers, Artillery House, Artillery Row, Victoria Street, Westminster, London, S.W.1.

Bridgwater. — Corporation. 6th June. Additional pumping plant at Colley Lane pumping station, comprising two electrically-driven centrifugal Fullway pumps, together with the necessary electrical equipment. R. A. Watson, borough engineer, Town Hall.

Chigwell.—U.D.C. 5th May. Conversion from gas to electricity of 114 class "B" lighting units. Engineer and surveyor, Council Offices, Old Station Road, Loughton, Essex.

Costa Rica.—La Proveeduria del Instituto Costaricense de Electricidad, San Jose. 9th May. Electrical equipment including cut-out switch, transformers, circuit-breakers, cable, telephone wire, etc., for the Rio Macho hydro-electric project. (E.S.B. 9003/58. Ten/31893.)*

Down.—County Education Committee. 1st May. Electrical installation in Holywood Technical School. Munce & Kennedy, architects, 133, University Street, Belfast.

Formosa.—Central Trust of China, Taipei. 14th May. Electronic instruments. (E.S.B. 9346/58.I.C.A. Ten/31990.)*

Greece.—Public Power Corporation, Athens. 29th April. Aluminium steel reinforced conductor. (E.S.B. 9330/58. Ten/31973.)*

Ministry of Finance, Athens. 29th April. V.h.f. receivers. (E.S.B. 9327/58. Ten/31972.)*

Huddersfield.—Corporation. Contractors wishing to tender for the electrical installation at Huddersfield College of Technology should apply by 1st May. (See this issue.)

India.—Bombay State Electricity Board. 30th April. Power transformers. (E.S.B. 9135/58. Ten/31883.)*

Damodar Valley Corporation, Calcutta. 5th May. 132 kV and 33 kV string insulators. (E.S.B. 9472/58. Ten/31976.)*

Kerala State Electricity Board, Trivandrum. 5th June. Six 110/66 kV and seventeen 66/11 kV transformers. (E.S.B. 8877/58. Ten/31891.)*

Madras State Electricity Board. 22nd May. Two 10,000 kVA, 110/33-11 kV and four 10,000 kVA, 110/22-11 kV transformers. (E.S.B. 9995/58. Ten/32015.)*

Ipswich.—Corporation. 20th May. Electrical installation in the Civic College. Barlow, Leslie & Coombs, consulting engineers, 5, Catherine Place, Westminster, London, S.W.1.

Iraq.—Central Foreign Purchasing Board, Baghdad. 25th May. H.f. radio telephone transmitter. (E.S.B. 9025/58. Ten/31894.)* Thunderstorm direction finding equipment. (E.S.B. 9024/58. Ten/31895.)* V.h.f. transmitter/receivers and communication equipment. (E.S.B. 9026/58. Ten/31896-7.)*

* Specifications may be inspected at the Export Services Branch, Board of Trade, Lacon House, Theobald's Road, London, W.C.1 (Chancery 4411; extension 769).

New Zealand.—G.P.O., Wellington. 15th May. Coaxial cable. (E.S.B. 8902/58. Ten/31878.)* 19th May. Switchboard cable and wire. (E.S.B. 9031/58. Ten/31861.)* Radio valves. (E.S.B. 9032/58. Ten/31889.)* 20th May. Coaxial resonator type filters. (E.S.B. 9474/58. Ten/31997.)*

Philippines.—National Power Corporation, Manila. 22nd May. Ventilation fans, louvres and air conditioning unit for Agno River No. 2 (Binga) hydro-electric project. (E.S.B. 9188/58. Ten/31915.)*

Pocklington.—R.D.C. 16th May. Submersible borehole pump with complete installation, including motor, controls, etc., Market Weighton pumping station. John H. Haiste & Partners, consulting engineers, Belmont House, 20, Wood Lane, Headingley, Leeds, 6.

Rhodesia and Nyasaland.—Federal Tender Board, Causeway. 9th May. Electric lamps. (E.S.B. 9286/58. Ten/31935.)*

Romford.—Corporation. 5th May. Electrical installations in houses and flats. (See this issue.)

Sheffield.—Corporation. Electrical contractors wishing to tender for the electrical installation in the new retail markets should apply by 5th May. (See this issue.)

South Africa.—Durban Electricity Department. 2nd May. Time switches. (E.S.B. 8999/58. Ten/31901.)* 16th May. Four 3 MVA transformers. (E.S.B. 9000/58. Ten/31876.)*

Union Tender and Supplies Board, Pretoria. 8th May. Fifty-five rectifiers. (E.S.B. 9268/58. Ten/31939.)* Magneto extension bells. (E.S.B. 9267/58. Ten/31943.)* Capacity and resistance bridge and impedance bridge. (E.S.B. 9269/58. Ten/31924.)*

Stores Department, South African Railways, Johannesburg. 9th May. Diesel-alternator sets, switchboards and rectifier battery chargers. (E.S.B. 9179/58. Ten/31913.)* 27th June. Lighthouse equipment. (E.S.B. 9180/58 Ten/31923.)*

Stoke-on-Trent.—City Council. 7th May. Street lighting equipment. City engineer and surveyor, Town Hall.

ORDERS PLACED

Newcastle-on-Tyne. — Regional Hospital Board. Electrical installation in connection with a new treatment block at South Shields General Hospital (£2,393).—Bonham Electric Co.

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors

Abbey Wood.—Shops and maisonnettes, Abbey estate; Unit Construction Co., Ltd., 34, St. James's Street, London, S.W.1.

Aylesbury.—Houses (200), Quarrendon area; borough surveyor.

Basildon.—Works and offices; Ilford, Ltd., Bower House, Havering, Romford.

Brighton.—Flats (72), Whitehawk estate; G. T. Crouch, Ltd., Eldred Avenue, Brighton.

Flats (64), Somerset Street; borough surveyor and engineer, King's Road, Brighton.

Cambridge.—Reconstruction of Central Grammar School for Girls; city surveyor.

Chingford.—Houses (36), South Avenue; Clive G. Dennis, town clerk, Town Hall, London, E.4.

Cranford.—Flats (24), off Cranford Lane; New Ideal Homesteads, Ltd., Ideal House, South Street, Epsom.

Darlington.—Houses (200), Barmpton Lane; Raine Brothers, builders, Bowman Street.

Fleetwood.—Dwellings (76), Chatsworth Avenue; Chadwick & Ward, surveyors, 18, Dickson Road, Blackpool.

Gateshead.—Eleven shops and seven flats, Beacon Lough estate; Wimpey & Co., Ltd., builders, Fenwick Terrace, Newcastle-on-Tyne.

Gillingham (Kent).—Houses (27), Manor Street, Brompton; town clerk, Municipal Buildings.

Gravesend. — Flats (104), Park Place (£181,711); Carlton Contractors, Ltd., 15, Lingfield Crescent, Eltham, S.E.9.

Guildford.—Central library, North Street; G. H. Cousey, borough engineer, Municipal Offices, High Street.

Guisborough.—Houses (50); U.D.C. surveyor.

Hull. — Boothferry Secondary Modern School (£172,120); A. Rankine, city architect, Guildhall.

London.—Redevelopment of Gaumont Cinema site, Haymarket, with offices and small theatre; Rank Organisation, 11, Belgrave Road, S.W.1.

Luton. — Works extensions; Laporte Chemicals, Ltd., Kingsway.

Maidstone.—Flats (48), in four blocks, Park Wood estate; T. Scholes, town clerk, 13, Tonbridge Road.

Normanton.—Grammar school extension; R. A. Easdale & Son, architects, Bradley Street, Castleford.

Northumberland.—R.C. school at Longbenton (£96,000); county architect, County Hall, Newcastle-on-Tyne.

Osbaldwick. — Primary school; W. W. Atkinson & Partners, architects, 4, Raymond Buildings, Gray's Inn, London, W.C.1.

Reading.—Ophthalmic block at the Royal Berkshire Hospital (£150,000); Oxford Regional Hospital Board, 43, Banbury Road, Oxford.

Redcar.—Proposed new school for North Riding E.C.; Leathart & Son, architects, 49, Welbeck Street, London, W.1.

Ruislip-Northwood.—Houses (98); U.D.C. surveyor, Oaklands Gate, Northwood, Middx.

Ryton (Co. Durham).—Development of private housing estate for John T. Bell & Sons, builders, Market Street, Newcastle-on-Tyne.

Sedgley.—Shous (20), Kent Street/Pale Street site; A. Young, architect, High Street, Dudley.

Southampton.—Dwellings (500), Northam area; borough engineer, Civic Centre.

Stevenage.—Dwellings (408), Brandley Hill area; Robert Marriott, Ltd., builders, Midland Works, Higham Road, Rushden.

Stockton-on-Tees.—Junior school at Hardwick; borough architect, 28, The Square.

Sunderland.—R.C. infants' school, Southwick (£45,000); D. & J. Ranken, Ltd., builders, Stockton Road.

Surbiton.—Offices and laboratories, Cox Lane and Mount Road; Borax Consolidated, Ltd., Borax House, Carlisle Place, S.W.1.

Wallsend.—Four-storey maisonnettes near Coast Road (£110,000), and sixty dwellings, Wiltshire Gardens; E. Faddy, borough engineer.

West Bromwich. — Works, Birmingham Road; Webley & Scott, Ltd., Weaman Street, Birmingham, 4.

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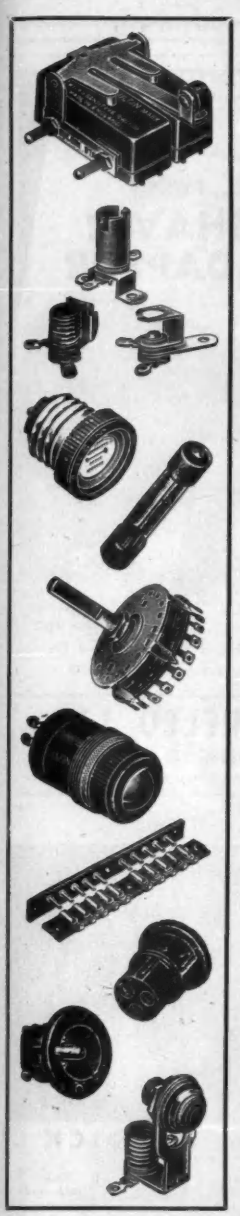

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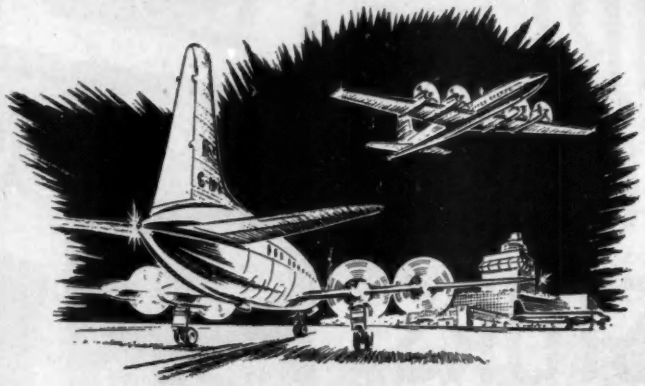

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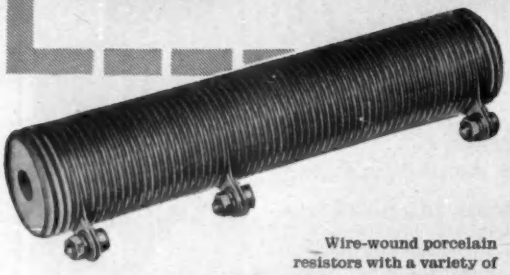

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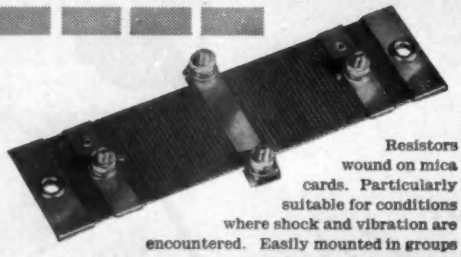

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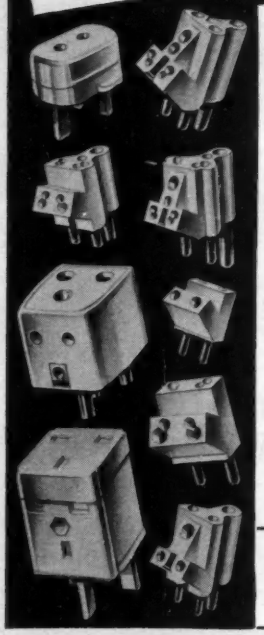

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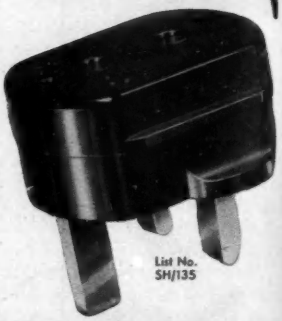

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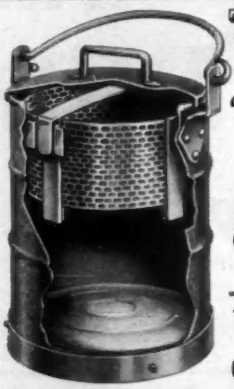

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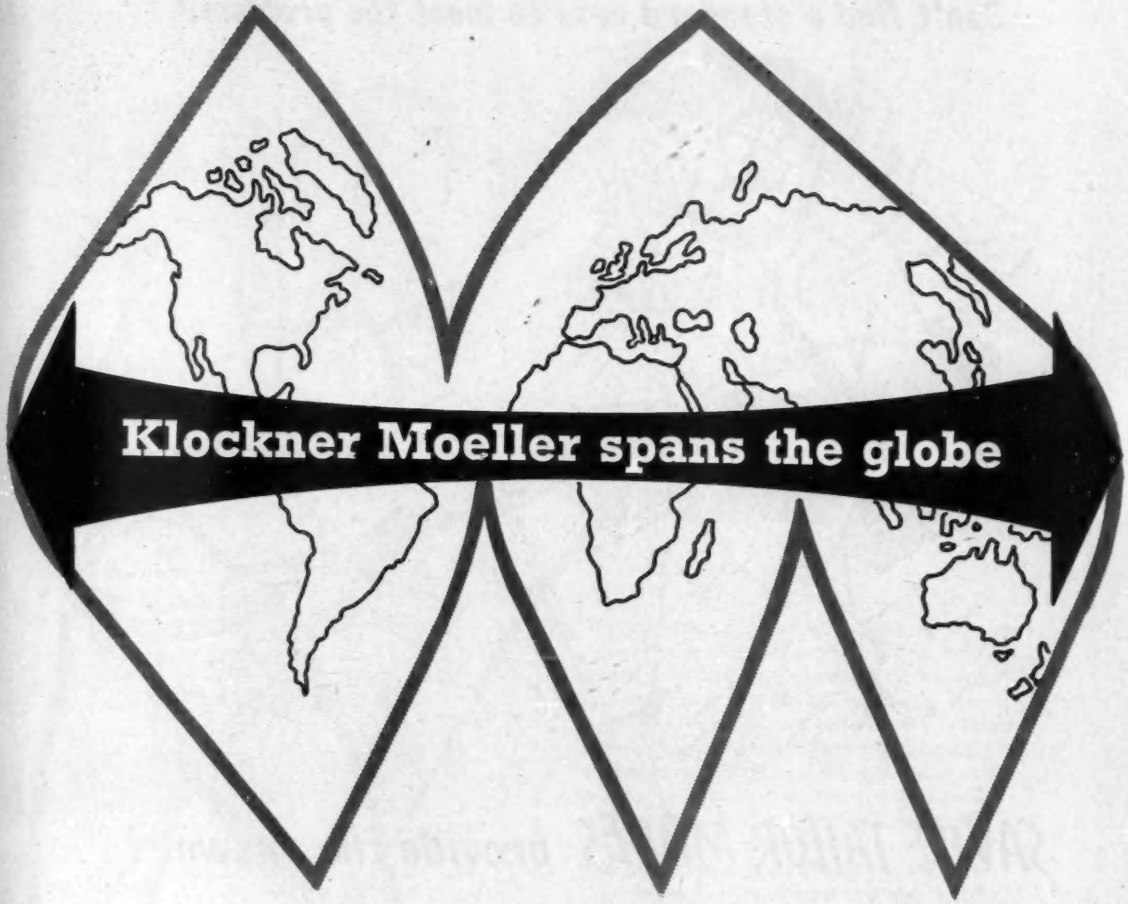

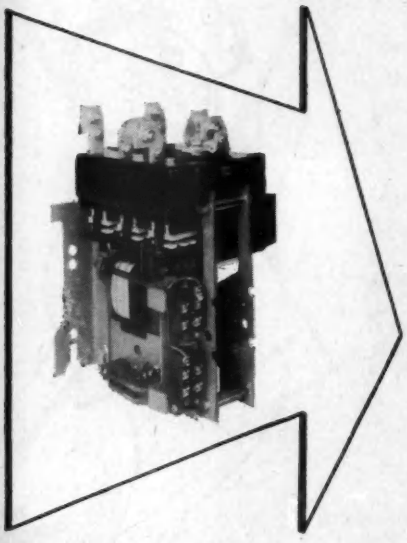

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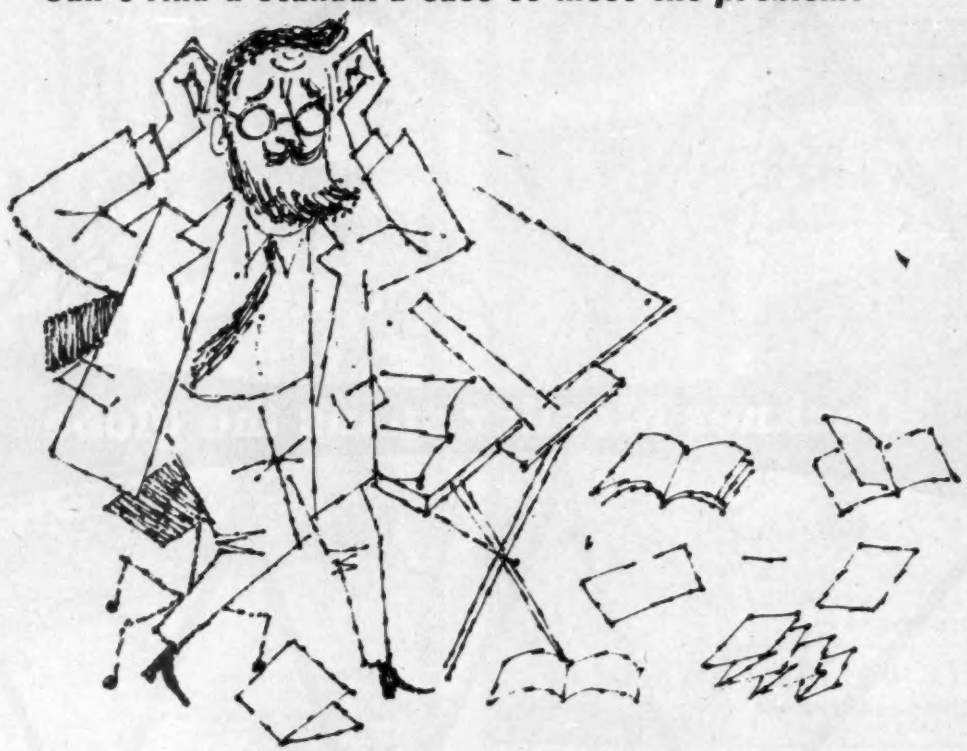

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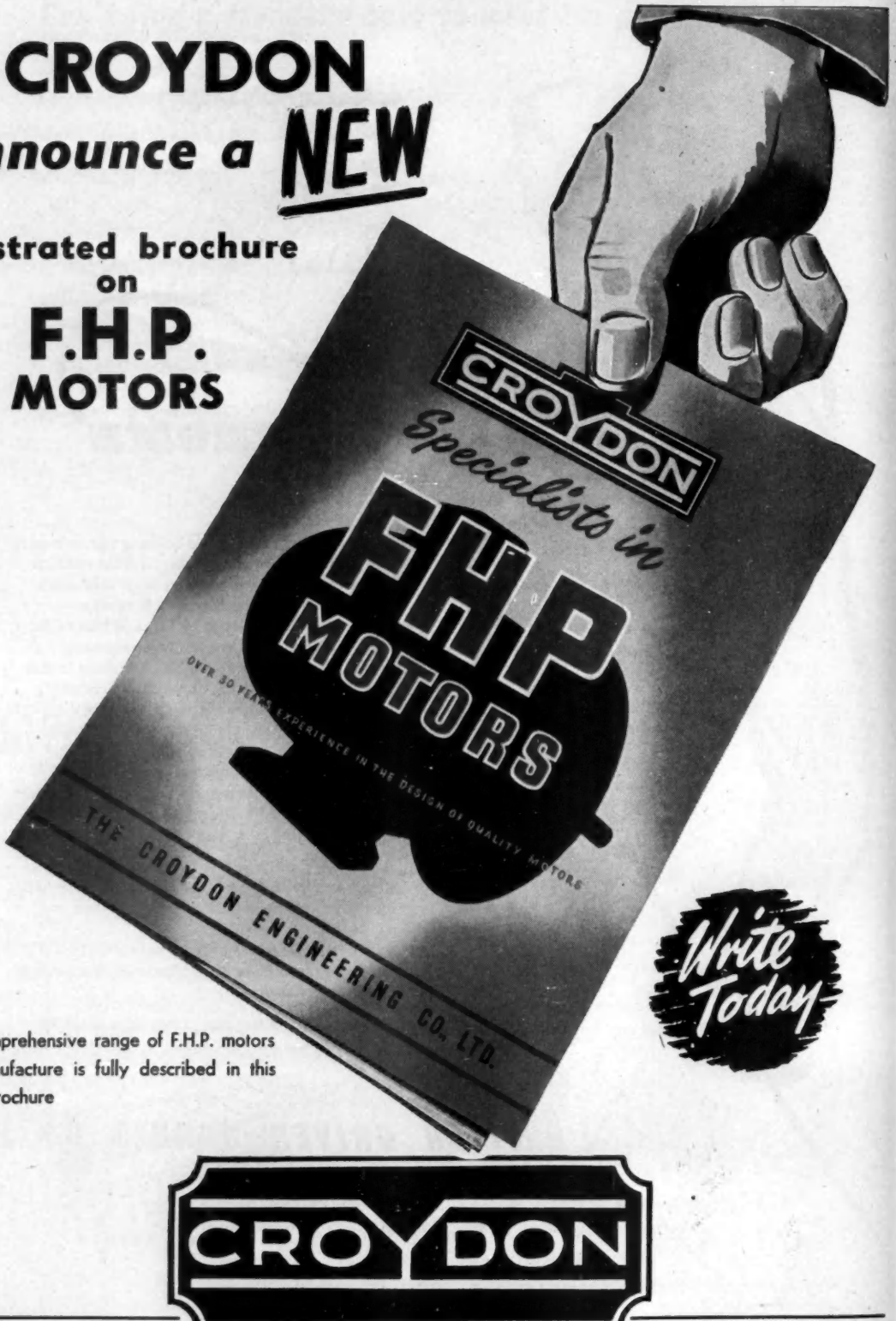

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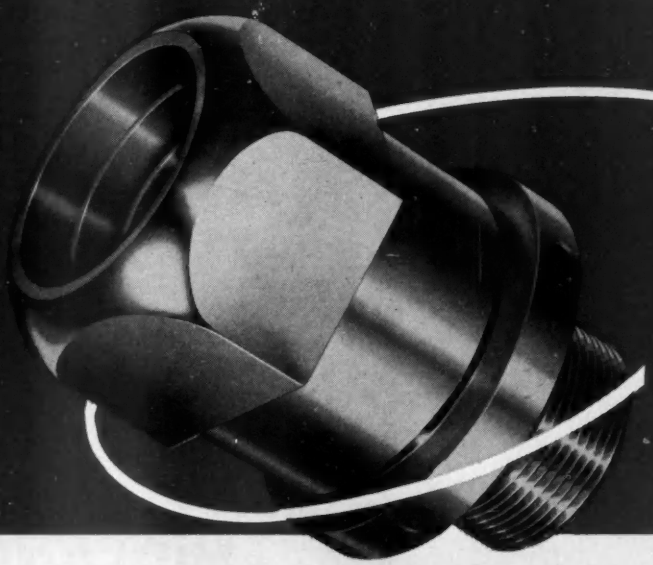

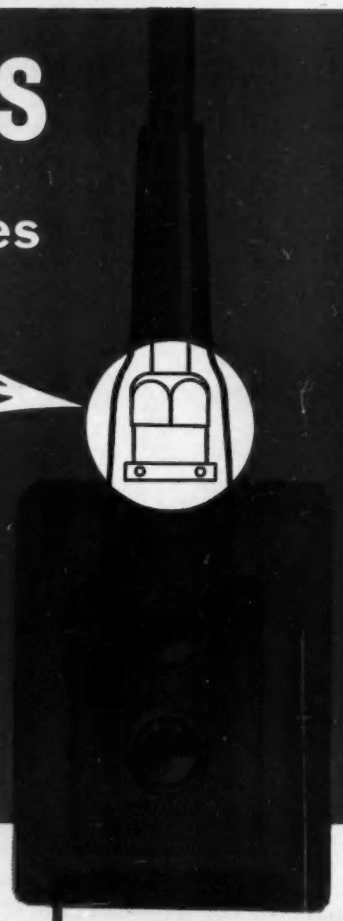

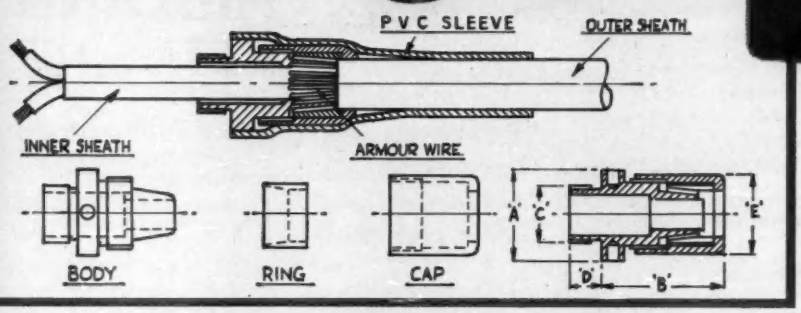

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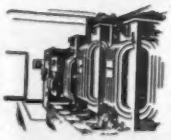

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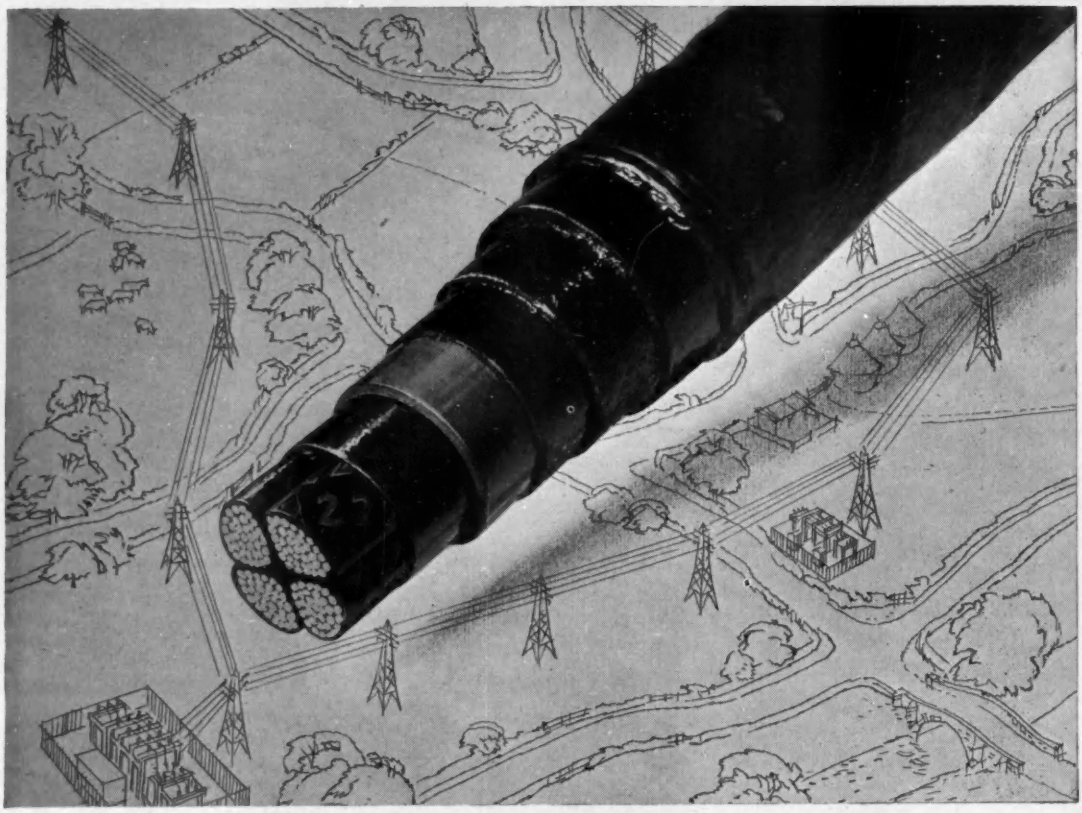

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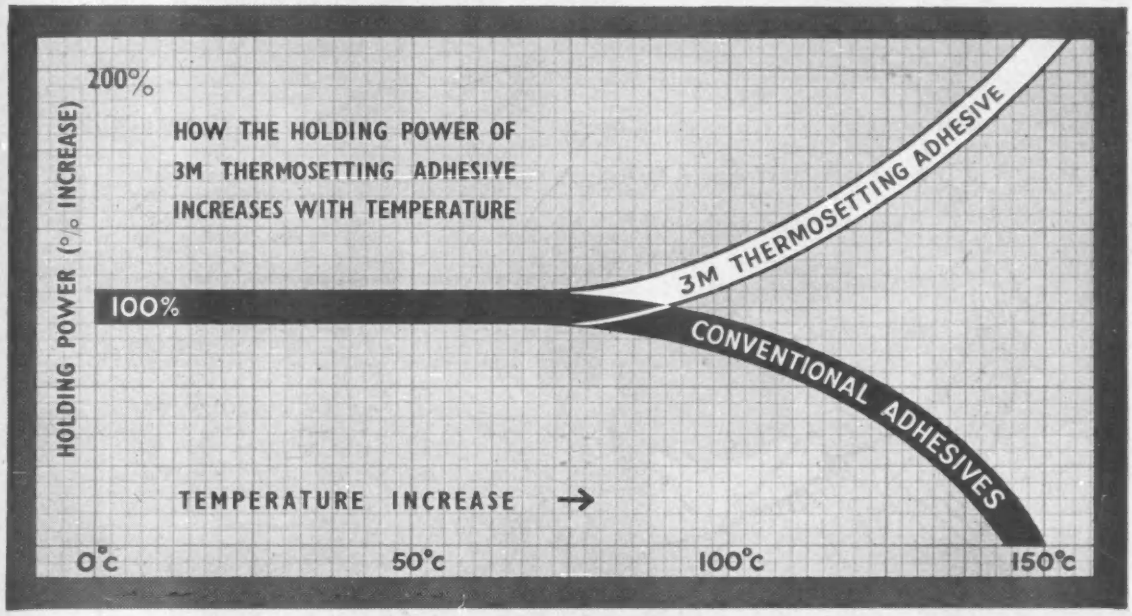

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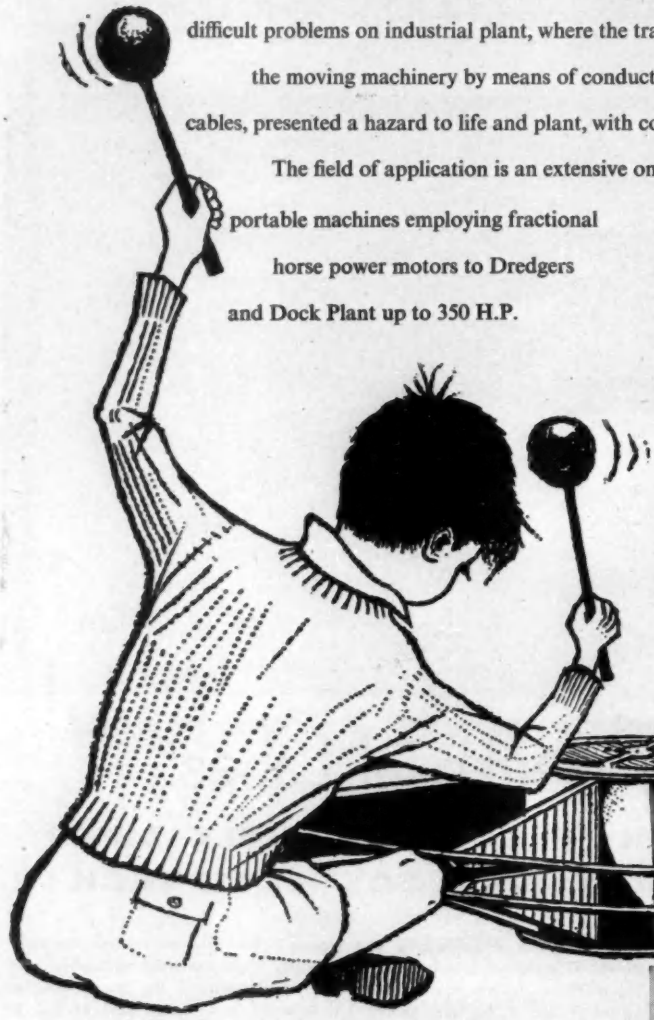

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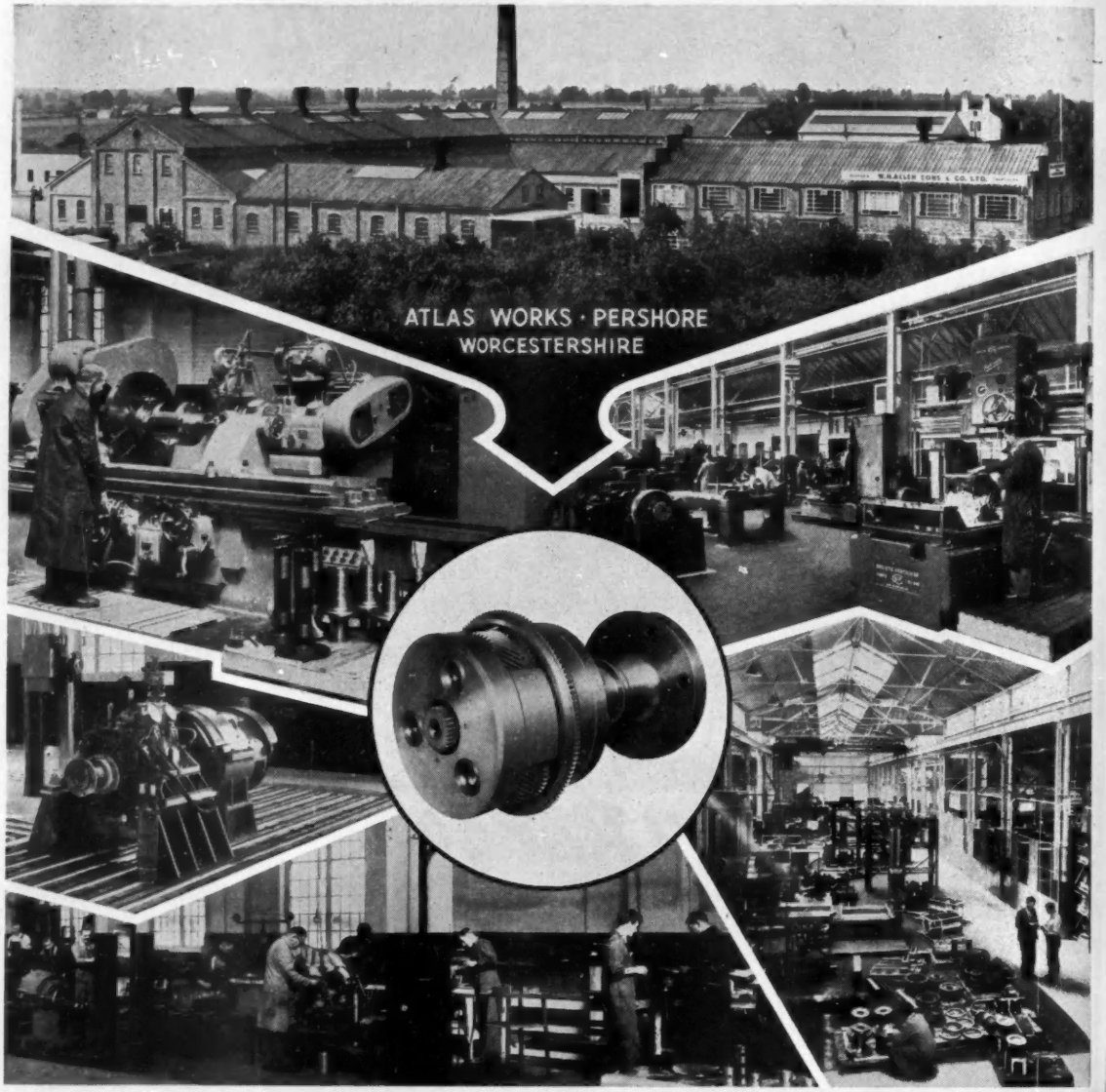

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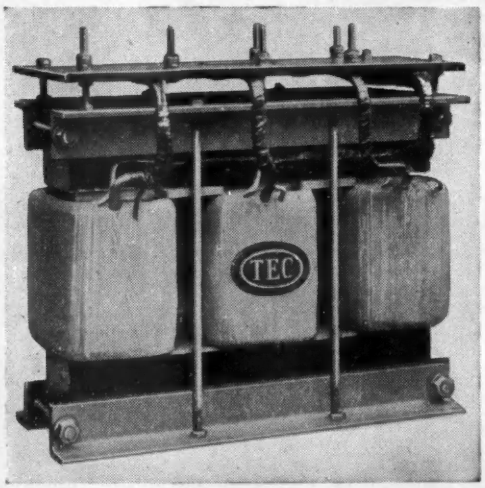

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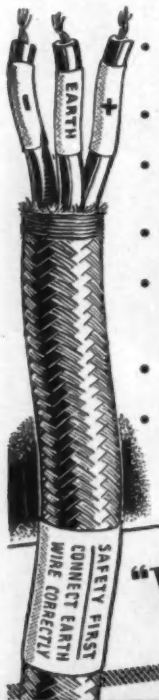

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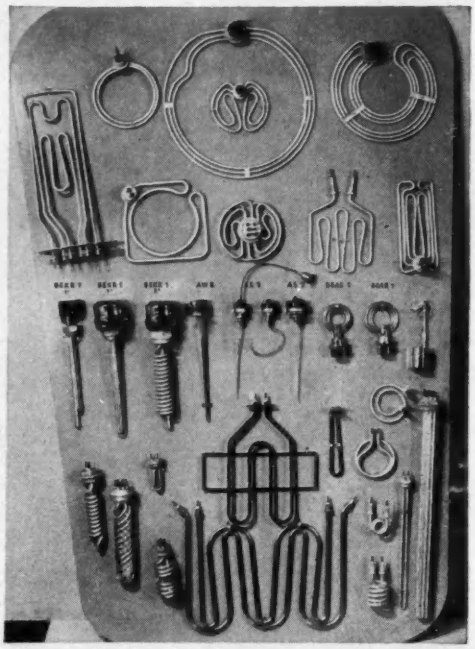

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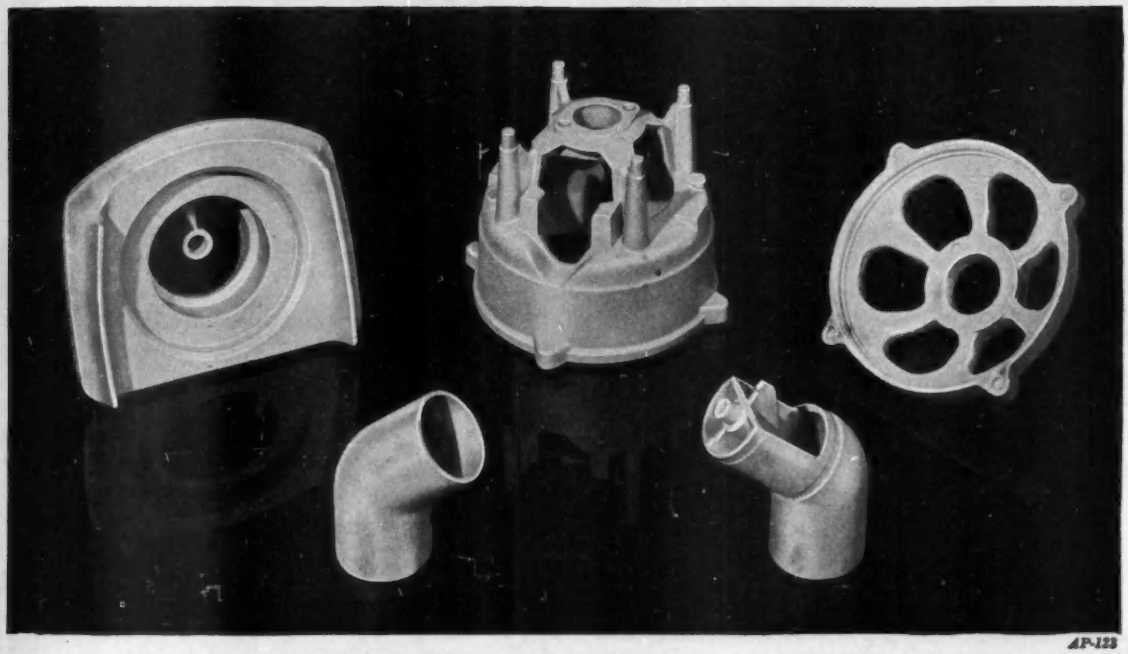

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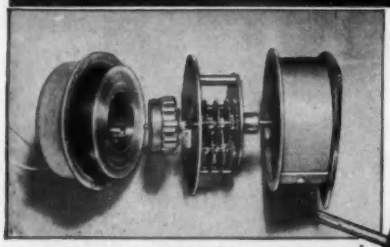

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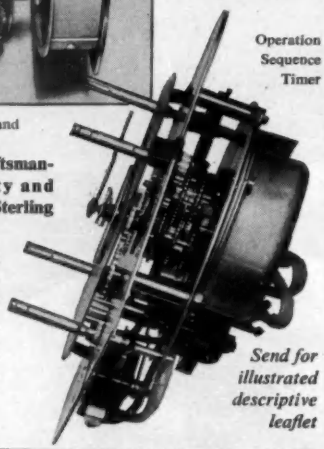

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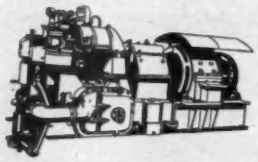

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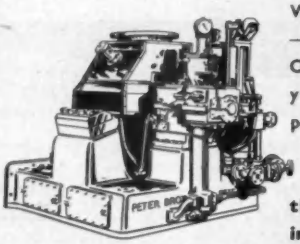

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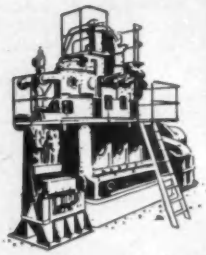

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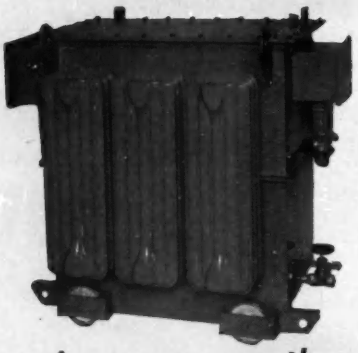

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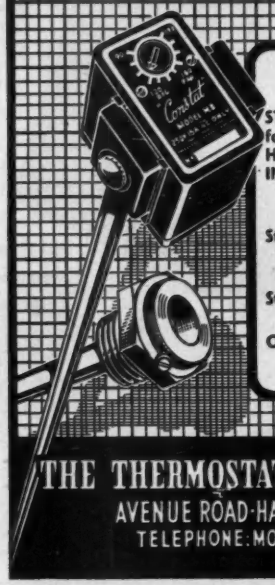

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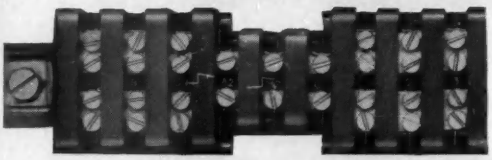

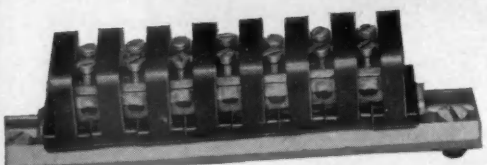

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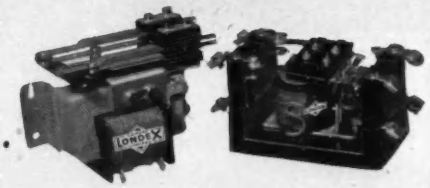

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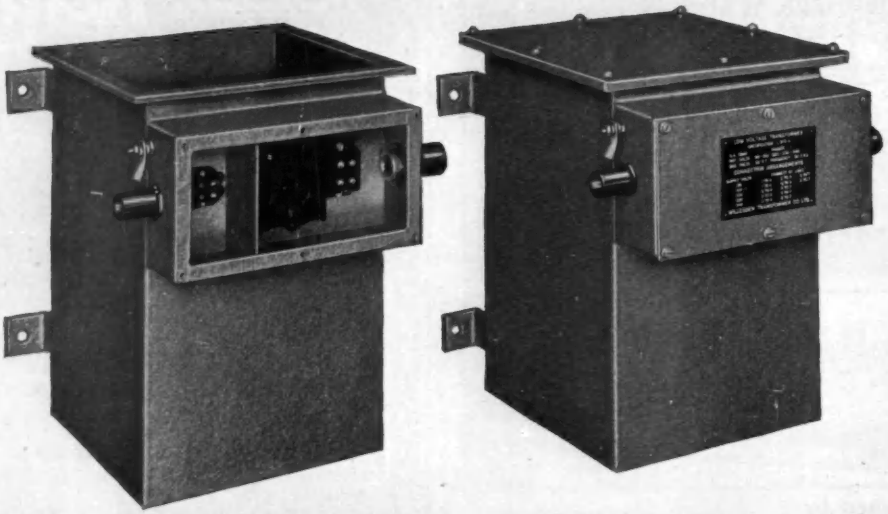

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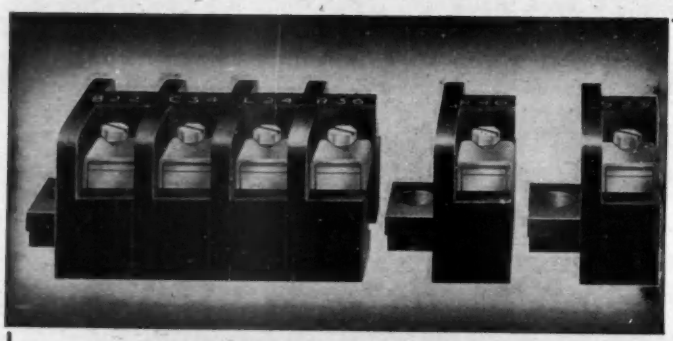

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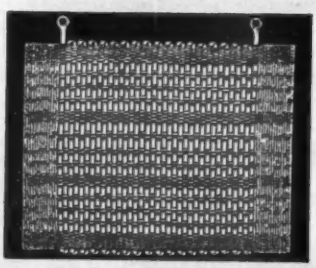

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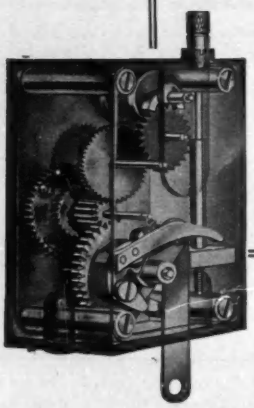

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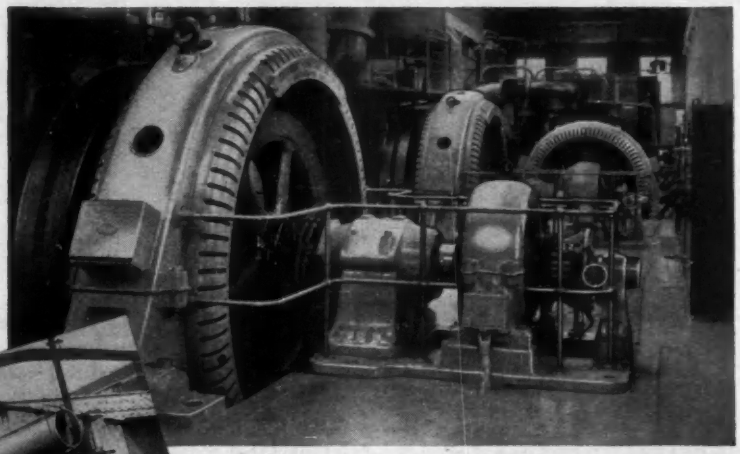

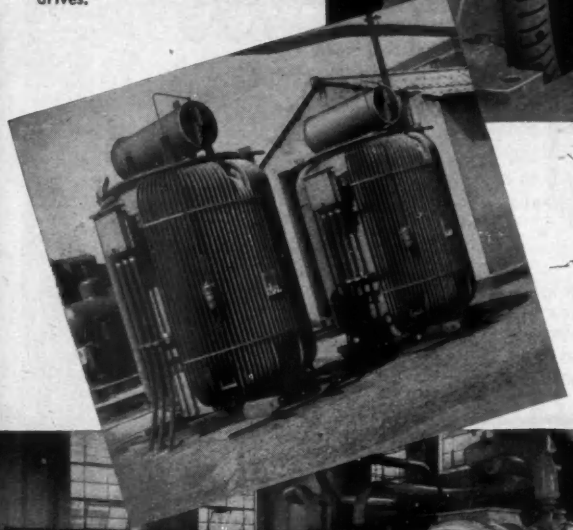

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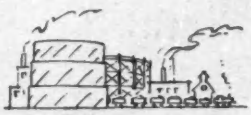

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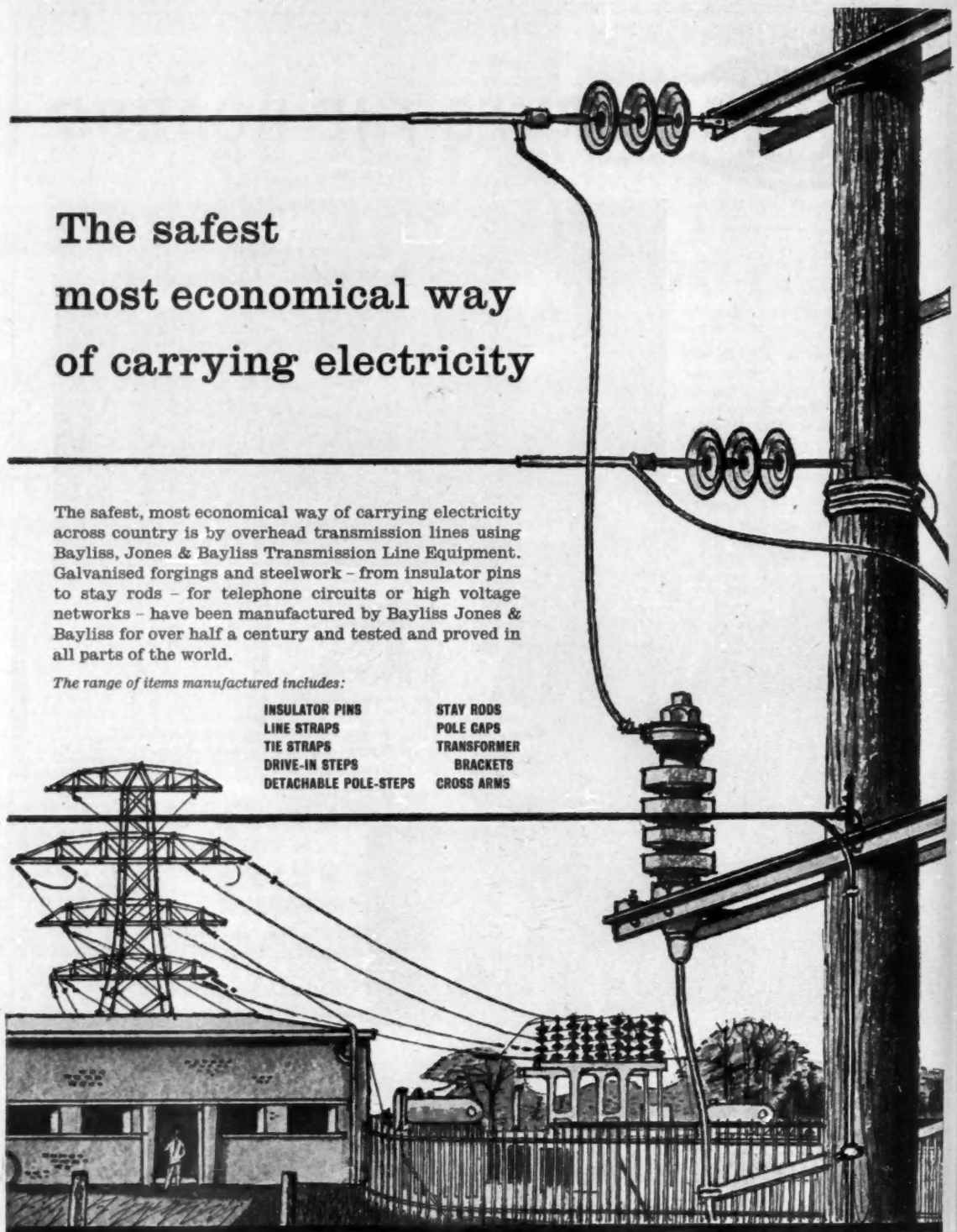

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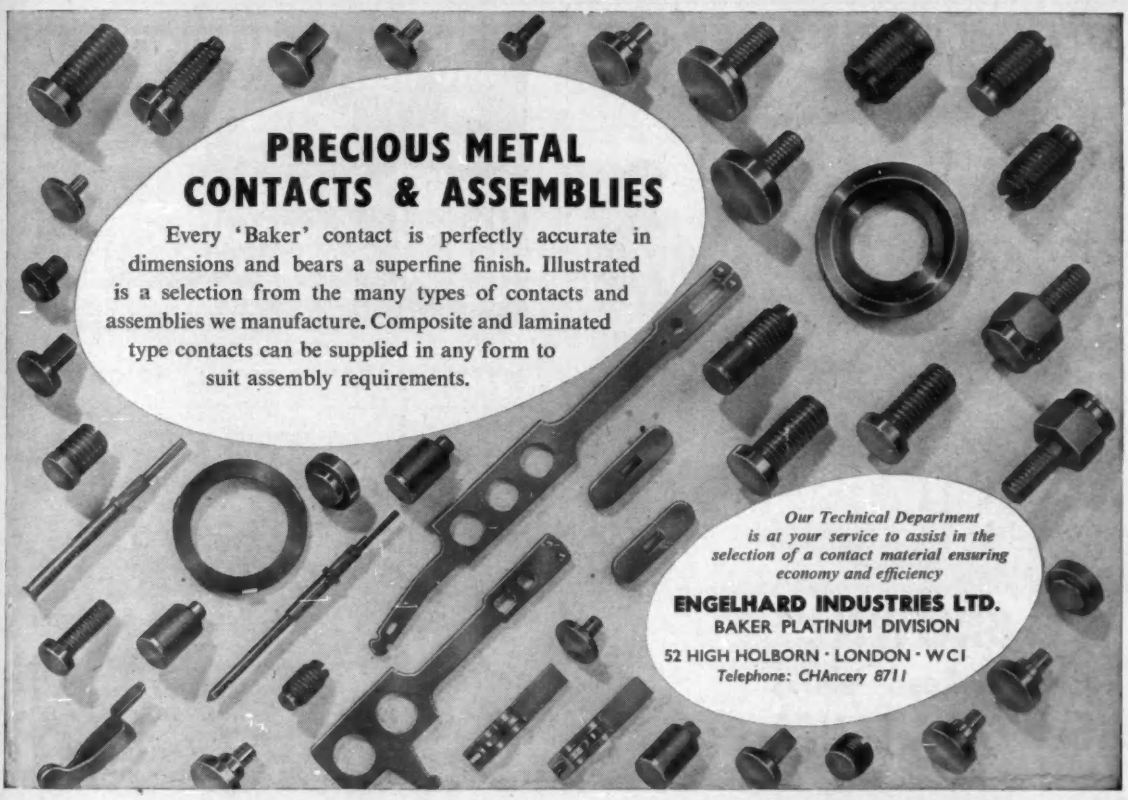

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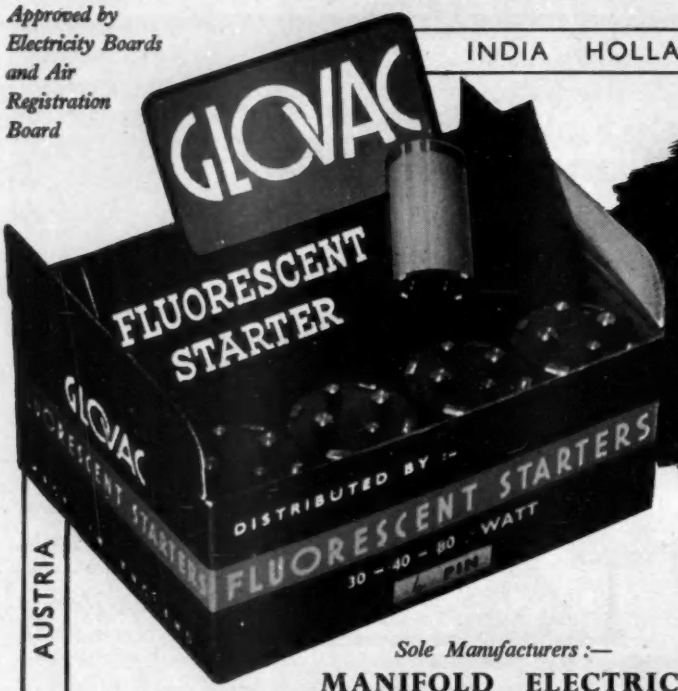

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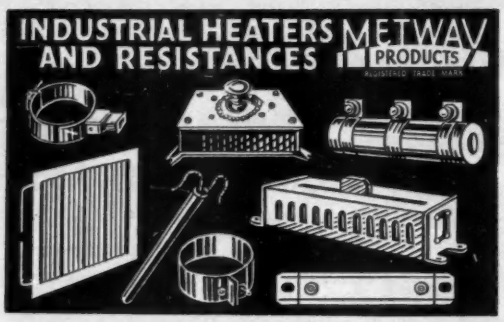

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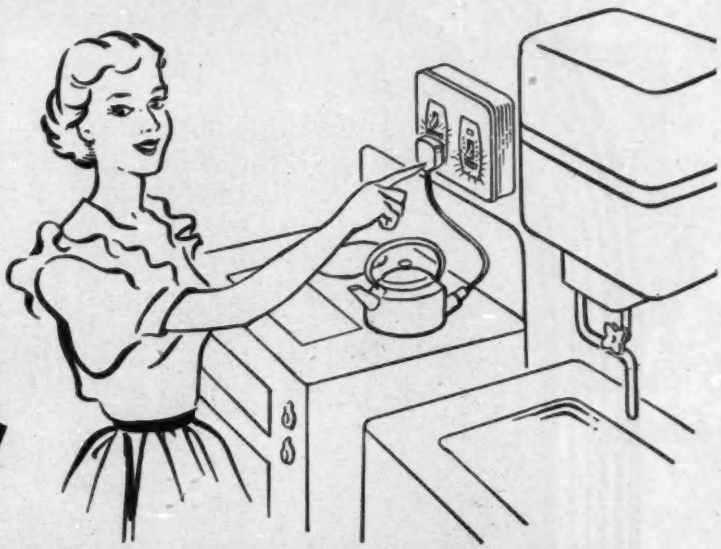

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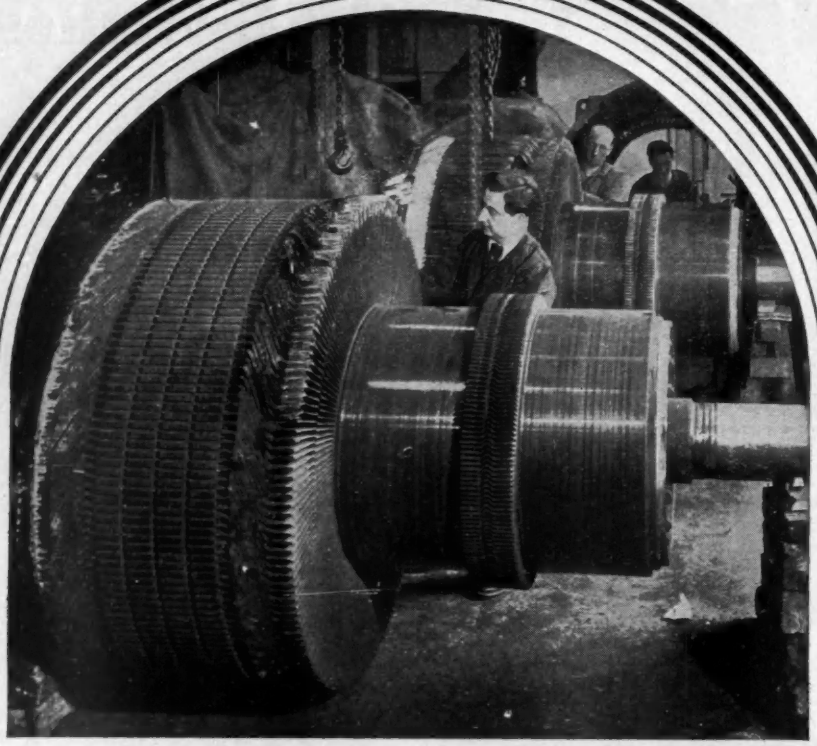

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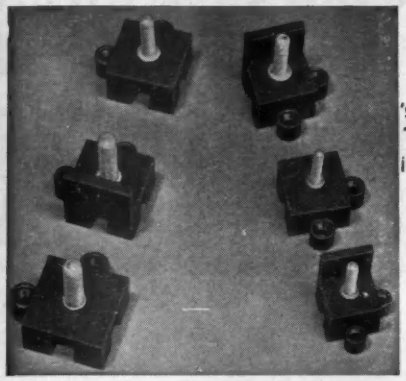

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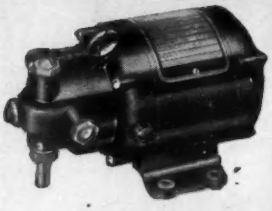

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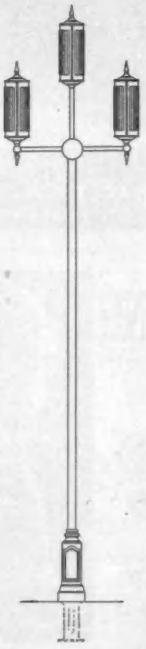

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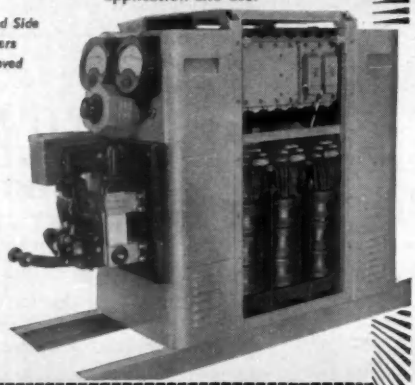

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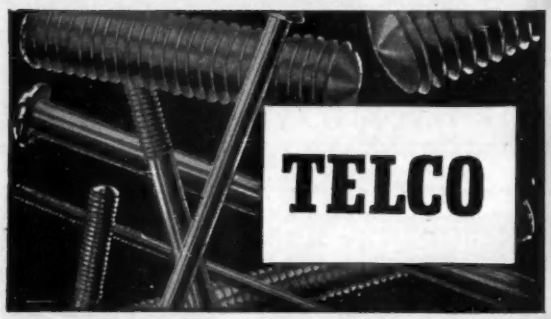

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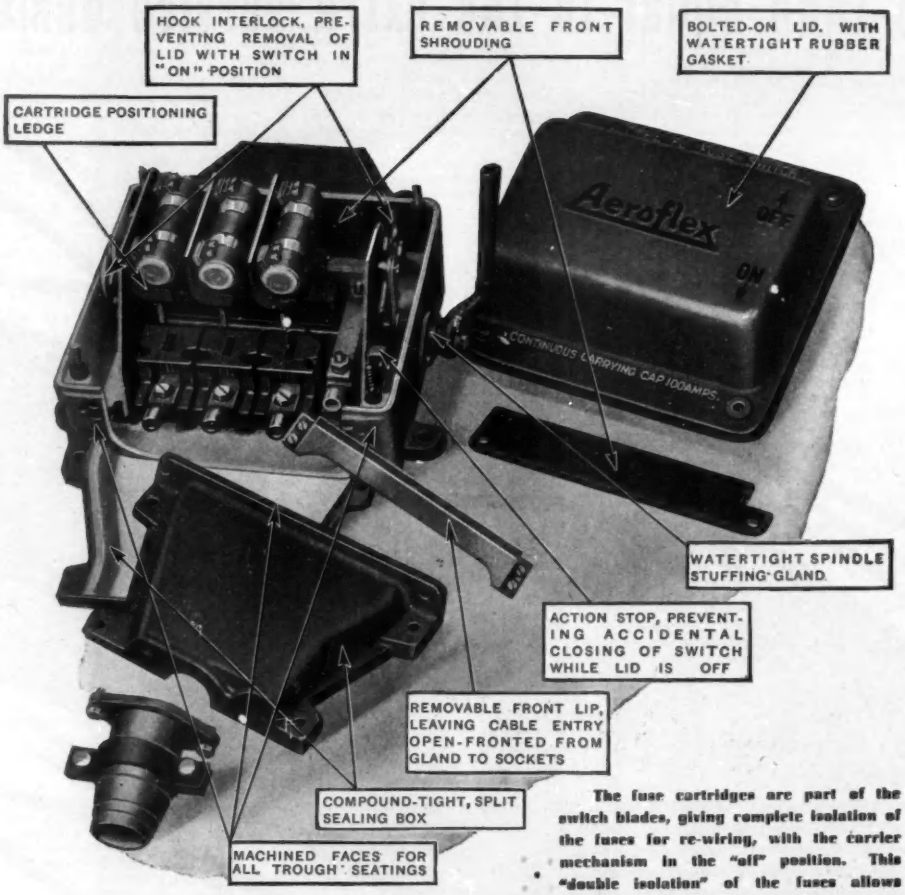
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PIRELLI GENERAL

CABLES

More than equal to the extra service demanded

ORDER FROM THE G.E.C.

The General Electric Co. Ltd., Magnet House, Kingsway, London, W.C.2

Classified Advertisements

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REPLIES to Box Numbers should be addressed to the Box Number in the advertisement, c/o ELECTRICAL REVIEW, Dorset House, Stamford Street, London, S.E.1, but if not to be delivered to any particular firm or individual they should be accompanied by instructions to this effect, addressed to the Manager of the ELECTRICAL REVIEW. Replies in such cases cannot be returned. The name of an advertiser using a Box Number will not be disclosed.

ADVERTISEMENTS are accepted up to First Post on Monday of the week of issue and should be addressed to ELECTRICAL REVIEW, Classified Advertisement Department, Dorset House, Stamford Street, London, S.E.1.

Original testimonials should not be sent with applications for employment

OFFICIAL NOTICES, TENDERS, ETC.

COUNTY BOROUGH OF HUDDERSFIELD

Huddersfield College of Technology

Electrical Installation

APPLICATIONS are invited from firms wishing to be considered for inclusion in a panel of contractors to be invited to tender for the electrical installation (second instalment) at the above College. The work will include the provision of light, power and external services for classrooms, laboratories and workshops.

Applications, which should be submitted to the undersigned not later than the 1st May, 1958, should give details and value of similar contracts which have been undertaken by the applicants.

H. GRAY,
Chief Education Officer.

Education Offices,
36, Ramsden Street,
Huddersfield. 3186

BOROUGH OF ROMFORD

Electrical Installations in Houses and Flats, Site "G," Harrow Crescent

TENDERS are invited for electrical installations in 244 proposed dwellings on the above site.

The specification and form of tender may be obtained from the Borough Engineer and Surveyor, Town Hall, Romford, on payment of a £2 2s. deposit (cheque), which will be refunded on receipt of a bona fide tender and all documents.

Sealed tenders in envelopes provided must be delivered to the undersigned not later than Monday, 5th May, 1958.

JOHN E. SYMONS,
Town Clerk.

Town Hall,
Romford.
18th April, 1958. 3202

CITY OF SHEFFIELD

Electrical Installation, New Retail Markets, Castle Hill

TENDERS are shortly to be invited from a selected list of electrical contractors for the electrical installation in the New Retail Markets at present under construction.

Contractors desirous of having their names considered for inclusion in the list should make application to the undersigned on or before the 5th May, 1958.

J. L. WOMERSLEY,
City Architect.

Town Hall,
Sheffield, 1.
25th April, 1958. 3173

SITUATIONS VACANT

ELECTRONIC ENGINEER

required to take charge of all electric control gear and switchboard department of company near Birmingham.

Applicants will be directly responsible to directors and should be capable of designing any type of electric automatic control system to meet customers' specifications, and should particularly have a complete knowledge of magnetic amplifier systems applied to automatic voltage control of alternators.

Applicants should be educated at the standard of university degree or Higher National Certificate, and should state age and experience in strict confidence to—Box 3070.

EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments. The successful candidates will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Chilterns Sub-Area

SUB-AREA HEADQUARTERS.

THIRD ASSISTANT ENGINEER
(Planning and Development)
(45/58.R).

Candidates should have had a sound technical training and experience in the planning and construction of large urban and rural distribution systems, including substations, at voltages up to 33 kV.

Salary N.J.B. Class L, Grade 10 (£995-£1,055).

FOURTH ASSISTANT ENGINEER
(Operation and Maintenance)
(42/58.N).

Applications are invited for the position of Fourth Assistant Engineer in the Operation and Maintenance Section of the Sub-Area Engineer's Department.

Duties will include assistance in the maintenance of substation equipment and overhead and underground systems up to 33 kV.

Salary N.J.B. Class L, Grade 13 (£835-£880).

For these appointments apply by letter, within 14 days, to the Manager, Chilterns Sub-Area, Eastern Electricity Board, Prebend Street, Bedford.

LUTON DISTRICT.

FOURTH ASSISTANT ENGINEER
(44/58.R).

Candidates should have had a sound technical training and suitable experience in the construction, operation and maintenance of H.V. and L.V. overhead and underground systems, including substations.

Salary N.J.B. Class H, Grade 11 (£790-£835).

Apply by letter, within 14 days, to the Manager, Luton District, Eastern Electricity Board, 487, Dunstable Road, Luton.

Essex Sub-Area

SUB-AREA HEADQUARTERS.

SENIOR ASSISTANT ENGINEER
(Commercial) (43/58.R).

Candidates should possess ability to organise and develop the selling activities in the Sub-Area. A sound technical training and a wide experience of electrical contracting work, including the control and supervision of apparatus repair workshops, and the preparation of schemes for floor warming, thermal space heating and commercial refrigeration is essential.

Salary N.J.B. Class L, Grade 4 (£1,560-£1,665) plus London allowance.

Apply by letter, within 14 days, to R. W. J. Benyon, M.I.E.E., A.I.I.A., Manager, Essex Sub-Area, Eastern Electricity Board, Millfield, Bentley, near Brentwood, Essex.

Northmet Sub-Area

SUB-AREA HEADQUARTERS.

THIRD ASSISTANT ENGINEER
(System Control) (Ref. 780)
(51/58.R).

Candidates should have had a sound technical training and experience of switching operations and maintenance work on high-voltage systems. A knowledge of protective equipment and of short circuit and load flow calculations is desirable.

Salary N.J.B. Class M, Grade 10 (£1,065-£1,140) plus London allowance plus a shift allowance of 10% over and above the schedule salary in accordance with Clause 4 of the N.J.B. Agreement.

(a) FOURTH ASSISTANT ENGINEER
(Ref. 702) (49/58.N).
(b) FOURTH ASSISTANT ENGINEER
(Operation and Maintenance)
(Ref. 696) (50/58.R).

Candidates for (a) should have had a sound technical training up to at least Higher National Certificate standard, and experience in the planning and construction of large urban and rural distribution systems, including substations, at voltages up to 33 kV.

Candidates for (b) should have had a good general and technical education, possess the Higher National Certificate or equivalent qualifications, and have had previous experience in system operation, testing and commissioning of protective gear and fault investigations.

Salary for each appointment, N.J.B. Class M, Grade 13 (£885-£930) plus London allowance.

GENERAL ASSISTANT ENGINEER
(Civil Engineering and Building)
(Ref. 781) (41/58.N).

Candidates should have had a good general and technical education, possess a sound knowledge of practical building and civil engineering construction, and be capable of setting out and supervising site works.

Salary N.J.B. Class M, Grade 16 (£740-£785) plus London allowance.

WAYLEAVE ASSISTANT
(Ref. 782) (46/58.R).

Candidates should have had a good education and be experienced in the negotiation with owners of property for the acquisition of substation sites and the obtaining of wayleaves.

Ability to assess and deal with agricultural and other damage claims is desirable.

Salary N.J.C. 3 (£690-£750) plus London allowance.

SUB-AREA CONSTRUCTION DEPT.

FOURTH ASSISTANT ENGINEER
(Ref. 779) (47/58.N).

Candidates should have had a sound technical training up to at least Higher National Certificate standard, be experienced in the supervision of underground cable-laying, both by direct and contract labour, and be capable of fault location, testing and commissioning on cable systems up to and including 33 kV.

Salary N.J.B. Class M, Grade 12 (£935-£995) plus London allowance.

GENERAL ASSISTANT ENGINEER
(Ref. 717) (48/58.R).

Candidates should have had a sound technical training.

The successful applicant will be required to assist in the supervision of direct or contract labour employed on cable laying and jointing of all classes of cable up to and including 33 kV.

Salary N.J.B. Class M, Grade 14 (£835-£880) plus London allowance.

For these appointments in the Northmet Sub-Area apply by letter to S. F. Osborne, M.I.E.E., A.C.I.S., A.M.B.I.M, Manager, Northmet Sub-Area, Eastern Electricity Board, Northmet House, Southgate, London, N14, by 5th May, 1958. 3204

TRANSFORMERS (WATFORD) LIMITED

require

TRANSFORMER
ENGINEER-DRAUGHTSMEN.

These appointments will command a really high salary for fully experienced applicants able to work quickly, accurately and individually from basic principles.

Apply Managing Director, Transformers (Watford) Ltd., Sandown Road, Watford, Herts. 3014

Situations Vacant (continued)

CENTRAL ELECTRICITY GENERATING BOARD

East Midlands Division

APPLICATIONS are invited for the following appointments in this Division :—

ASSISTANT ENGINEER
(Mechanical Maintenance),
CASTLE DONINGTON POWER STATION (Vacancy No. 61/58/ER).

Applicants should have received a sound technical training and have had wide practical experience in the maintenance of power station mechanical plant.

Preference will be given to candidates who are corporate members of a recognised professional institution or who hold qualifications leading to such membership.

Salary will be in accordance with Class L, Grade 8 (£1,160-£1,235 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 30th April, 1958.

ASSISTANT ENGINEER
(Electrical Maintenance),
CASTLE DONINGTON POWER STATION (Vacancy No. 62/58/ER).

Applicants should have received a sound technical training and have had wide practical experience in the maintenance of power station electrical plant.

Preference will be given to candidates who are corporate members of a recognised professional institution or who hold qualifications leading to such membership.

Salary will be in accordance with Class L, Grade 8 (£1,160-£1,235 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 30th April, 1958.

FOURTH ASSISTANT ENGINEER,
STAYTHORPE TRANSMISSION SECTION
(Vacancy No. 69/58/ER).

The section contains extensive 275-kV and 132-kV equipment, and the candidates must have had wide experience in the maintenance and operation of 132-kV lines and substations in a transmission section.

Preference will be given to candidates with qualifications leading to Corporate Membership of the Institution of Electrical Engineers.

Salary will be in accordance with Class AX/EX, Grade 7 (£810-£1,035 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 30th April, 1958.

SHIFT CONTROL ENGINEER,
DRAKELOW POWER STATION
(Vacancy No. 63/58/ER).

Applicants should have had a good general education and technical training with practical experience in the control and operation of large modern switchgear. Preference will be given to candidates who possess technical qualifications to Higher National standard.

The salary will be in accordance with Class J, Grade 10 (£885-£930 per annum) of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications, 7th May, 1958.

THIRD ASSISTANT ENGINEER,
GENERATION (Operation) DEPT.,
OPERATIONAL RESEARCH SECTION,
DIVISIONAL HEADQUARTERS
(Vacancy No. 64/58/ER).

Applicants should be fully qualified electrical or mechanical engineers, and previous experience of operational research is desirable, but not essential, as there will be opportunities for training in the technique.

Salary will be in accordance with Class AX/EX, Grade 6 (£895-£1,140 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 7th May, 1958.

PLANT SHIFT CONTROL
ENGINEERS, CASTLE DONINGTON POWER STATION
(Vacancy No. 65/58/ER).

Experience desirable in control of boilers and turbines at high pressure and temperature, pulverised fuel, together with electrical control room experience.

Technical qualifications to Higher National Certificate desirable.

Salary will be in accordance with Class L, Grade 10 (£995-£1,055 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 7th May, 1958.

FOURTH ASSISTANT ENGINEER,
DRAKELOW TRANSMISSION SECTION
(Vacancy No. 68/58/ER).

Applicants should have experience of the maintenance and operation of E.H.T. overhead lines, transformer and switchgear.

Preference will be given to candidates with qualifications leading to Corporate Membership of the Institution of Electrical Engineers.

Salary will be in accordance with Class AX/EX, Grade 8 (£710-£935 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 7th May, 1958.

SECOND ASSISTANT CHEMIST,
WILLINGTON "A" POWER STATION
(Vacancy No. 70/58/ER).

Candidates should have had previous experience in a power station laboratory and should hold the Higher National Certificate in Chemistry. They should be familiar with the methods of sampling and analysis of coal, water and oil and with the interpretation and application to power station practice of the analytical results.

Salary will be in accordance with Class K, Grade 11 (£885 - £930 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 7th May, 1958.

SENIOR ASSISTANT ENGINEER
(Resident),
CASTLE DONINGTON POWER STATION (Vacancy No. 66/58/ER).

The duties for the above position include general supervision of the erection and commissioning of all mechanical and electrical plant; for example, turbo-alternators, and condensing plant, feed heating equipment, boilers, pumps, high-pressure steam and feed piping, switchgear, transformers, and cables, coal and ash handling plant and ancillary equipment. Corporate Membership of the Institution of Mechanical Engineers or the Institution of Electrical Engineers would be a recommendation.

Candidates should be experienced in the supervision of such power station equipment and in co-ordinating work on site in close collaboration with the Resident Engineer responsible for civil engineering and building works and with Divisional Headquarters' staff.

Salary will be in accordance with Class AX/EX, Grade 3 (£1,330-£1,595 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 7th May, 1958.

SENIOR ASSISTANT ENGINEER
(Resident),
SPONDON "H" POWER STATION
(Vacancy No. 67/58/ER).

The duties for the above position include general supervision of the erection and commissioning of all mechanical and electrical plant; for example, turbo-alternators, and condensing plant, feed heating equipment, boilers, pumps, high-pressure steam and feed piping, switchgear, transformers, and cables, coal and ash handling plant and ancillary equipment. Corporate Membership of the Institution of Mechanical Engineers or the Institution of Electrical Engineers would be a recommendation.

Candidates should be experienced in the supervision of such power station equipment and in co-ordinating work on site in close collaboration with the Resident Engineer responsible for civil engineering and building works and with Divisional Headquarters' staff.

Salary will be in accordance with Class AX/EX, Grade 3 (£1,330-£1,595 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 7th May, 1958.

GENERAL ASSISTANT ENGINEER
(Planning Office),
CASTLE DONINGTON POWER STATION (Vacancy No. 40/58/ER).

Applicants should have had wide practical experience of power station maintenance, and be capable of planning and progressing work, compiling records and reports and controlling plant spares.

Salary will be within Class L, Grades 17/15 (£635-£785 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 7th May, 1958.

These appointments will be pensionable under the terms of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT, which may be obtained from the Divisional Establishments Officer, Central Electricity Generating Board, East Midlands Division, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated. PLEASE QUOTE VACANCY NUMBER.

L. F. JEFFREY,
Divisional Controller.

16th April, 1958. 3185

AUTOMATIC TELEPHONE & ELECTRIC COMPANY LIMITED

BRITISH INSULATED CALLENDER'S CABLES LIMITED

BRITISH TELECOMMUNICATIONS RESEARCH LIMITED

Telecommunications and Electronics Group, Graduate Apprenticeship Scheme

Appointment of a Training Officer

APPLICATIONS are invited for the post of TRAINING OFFICER for a Graduate Engineering Apprenticeship scheme which is sponsored by the three companies named above. This is a new appointment and offers excellent opportunities for the right man to introduce and develop a new system of training for graduates.

Candidates should possess a university degree or equivalent qualification in science or engineering and should be prepared to lecture to graduate apprentices on general and/or specialist topics.

Industrial and/or teaching experience is desirable, but above all candidates must have a real and sincere interest in education and training.

The post will involve a considerable amount of travelling, and initially there is the possibility of an introductory training period for the successful candidate. It is essential, therefore, that applicants are prepared to be mobile.

A commencing salary in the four-figure range is envisaged and will be determined by age and experience.

The successful candidate will be required to join a contributory pension fund.

Further details of the post and application forms may be obtained from—

The Personnel Manager
Automatic Telephone & Electric Co. Ltd.
Strowger Works, Liverpool, 7

3171

ATOMIC POWER CONSTRUCTIONS LTD.

requires

Senior Electrical Draughtsmen

OPPORTUNITIES have now arisen for SENIOR ELECTRICAL DRAUGHTSMEN who are interested in entering the rapidly developing field of nuclear energy, and wish to take part in the electrical design of nuclear power stations.

Positions are vacant for men experienced in the following :—

Plant layout.
Cable system design and installations.
Control systems and diagrams.

The work is interesting and varied and good salaries will be paid to the right men.

Applications giving details of age, qualifications, experience, etc., should be sent to the Secretary, Department ED/ER, Atomic Power Constructions Limited, 28, Theobalds Road, London, W.C.1. 3184

CITY OF SALISBURY, SOUTHERN RHODESIA

Vacancies in the Electricity Department

APPLICATIONS are invited for posts (a), (b) and (c) in the Generation Section and post (d) in the Distribution Section of the Salisbury, Southern Rhodesia, Municipal Electricity Department.

Salary for posts (a) and (d):
£2,300 × £100 to £2,600.
Salary for post (b):
£2,025 × £75 to £2,250.
Salary for post (c):
£1,725 × £50 to £1,875.

The successful candidate for post (a) will be responsible under the City Electrical Engineer and his Assistant for the whole of the Generation Section of the Undertaking.

Details of the City's power stations, comprising 153 MWs of plant, along with brief particulars of the Pension and Widows' and Orphans' Fund, leave, housing, etc., can be obtained from the undersigned on application.

Candidates, who must be chartered engineers, must have had considerable experience in the operation of power stations with modern pulverised fuel boilers.

The income tax on £2,300 at present rates for a married man with one child would be approximately £156, and on £2,600 would be approximately £230.

The successful candidate for post (b) will be the immediate Assistant to the engineer appointed under post (a).

The income tax on £2,025 at present rates would be approximately £112 for a married man with one child.

The successful candidate under post (c) will be responsible to the Power Station Superintendents and to the above officials for the preparation, accuracy and correlation of all technical data required for the efficient control of the generating plant installed in the Salisbury power stations.

He will also be responsible for the thermal or mechanical testing of plant in accordance with British standards, or standard practice.

The position calls for a knowledge of the theory of electrical, fluid and temperature measurement techniques as applied to thermal power station plant testing procedure, and practical experience in the operation of electrical generating plant is essential.

The income tax on £1,725 for a married man with one child would be approximately £80 per annum, and on £1,875 approximately £86 per annum.

Applications are also invited for post (d), the successful candidate for which will be responsible under the City Electrical Engineer and his Assistant for the whole of the Distribution Section of the Undertaking.

Details of the City's Distribution Department, along with brief particulars of the Pension and Widows' and Orphans' Fund, leave, housing, etc., can be obtained from the undersigned on application.

Candidates must state whether they are applying for post (a), post (b), post (c) or post (d) or a combination of any, and must be Associate Members of either the British Institution of Mechanical Engineers or the British Institution of Electrical Engineers.

The successful applicant will be required to submit a satisfactory medical certificate and serve a probationary period of six months, and if thereafter confirmed in his appointment, to join the Southern Rhodesia Local Authorities' Joint Pension and Widows' and Orphans' Fund. Candidates are requested to submit full particulars of their qualifications, training and experience, which should include details of positions held and salaries received. Particulars of age, place of birth, nationality and marital state should also be given, and copies of not more than three recent testimonials may be included.

Applications, on air mail paper, should be addressed to the undersigned, and arrive not later than the 16th May, 1958.

DAVIS & SOPER LTD.
54, St. Mary Axe,
London, E.C.3. 3176

CLASSIFIED ADVERTISEMENTS ARE PREPAID

LONDON ELECTRICITY BOARD

Demonstrator (Female)

APPLICATIONS are invited for the above position in the Kent Suburban District, based at Bexleyheath.

Applicants should be suitably qualified, holding the E.A.W. or other approved certificate including electrical housecraft, and having experience in conducting demonstrations at service centres and general service centre duties. They should also be experienced in advising consumers on the selection and use of domestic appliances, both at the service centre and on consumers' premises.

The post is graded within the National Joint Council Agreement (Administrative and Clerical Grades) as Grade 1, i.e., £500 to £600 per annum, plus the appropriate London area allowance.

Application forms obtainable from Personnel Officer, 46, New Broad Street, London, E.C.2, to be returned completed within fourteen days of the publication of this advertisement. Please quote ref. PER/2440/R. 3169

NUCLEAR POWER STATION DESIGN AND LAYOUT

THE ENGLISH ELECTRIC COMPANY LIMITED

at Whetstone, near Leicester

require a

MECHANICAL ENGINEER

and an

ELECTRICAL ENGINEER

preferably with some experience in a consulting engineering team engaged on large nuclear power station design schemes.

These are interesting posts for men engaged on power station layout to work exclusively on nuclear power stations for Great Britain and abroad.

A few vacancies exist in this team for :—

ELECTRICAL DRAUGHTSMEN

and

MECHANICAL DRAUGHTSMEN

with suitable experience and of H.N.C. standard.

Please write giving brief details of education, experience and present salary to :—

Dept. C.P.S.

Marconi House, 336/7, Strand

London, W.C.2

quoting reference BR.1816B

3187

SOUTHERN ELECTRICITY BOARD

Planning Engineer

Yeovil District of No. 4 (Bournemouth) Sub-Area. Salary N.J.B. Class F, Grade 7 (£885 × £15 to £930 per annum). N.J.B. conditions of service.

The duties of the post will include the preparation of schemes and estimates for extensions of and reinforcement to overhead and underground H.V. and L.V. networks. Applicants should have had sound experience in electricity supply distribution and the possession of suitable technical qualifications would be an advantage. The successful candidate will be required to carry out standby duties if and when called upon to do so.

Applications on forms obtainable from the Sub-Area Secretary, 1, Priory Road, Bournemouth, and returned to him, in envelopes suitably endorsed, not later than 5th May, 1958.

General Assistant Engineer

Sub-Area Engineering Department (Meter Section), of No. 1 (Southall) Sub-Area, located at Waterloo Road, Uxbridge, Middlesex. Salary N.J.B. Class L, Grade 16 (£725-£770 per annum, inclusive of London allowance). N.J.B. conditions of service.

Applicants should have experience in three phase meter testing, instrument transformer testing, assisting in the standardising of wattmeters and the commissioning of special equipment.

Applications on forms obtainable from the Sub-Area Secretary, 2/6, Windmill Lane, Southall, Middlesex, and returned to him, in envelopes suitably endorsed, not later than 5th May, 1958.

General Assistant Engineer

Aldershot District of No. 3 (Portsmouth) Sub-Area. Salary N.J.B. Class G, Grade 12 (£685 × £15 to £730 per annum). N.J.B. conditions of service.

The duties of the post will be to assist in the preparation of schemes and estimates for extensions and/or reinforcements to overhead and underground H.V. and L.V. networks.

Applications on forms obtainable from the Sub-Area Secretary, Lower Drayton Lane, Cosham, Portsmouth, and returned to him, in envelopes suitably endorsed, not later than 5th May, 1958.

General Assistant Engineer

North Sub-Section, Construction Department, Farnborough, No. 3 (Portsmouth) Sub-Area. Salary N.J.B. Class K, Grade 16 (£635 × £15 to £680 per annum). N.J.B. conditions of service.

The duties of the post will be to assist with distribution including minor construction work and general maintenance of H.V. and L.V. overhead and underground distribution systems, substation plant, etc. This appointment may involve standby duties. Applicants should possess suitable technical qualifications.

Applications on forms obtainable from the Sub-Area Secretary, Lower Drayton Lane, Cosham, Portsmouth, and returned to him, in envelopes suitably endorsed, not later than 5th May, 1958.

The successful candidates for the above appointments will be required to contribute to the Electricity Supply (Staff) Superannuation Scheme, if eligible. 3205

NORTH STAFFORDSHIRE TECHNICAL COLLEGE

Stoke-on-Trent

Principal: H. W. Webb, O.B.E., D.Sc., F.R.I.C., M.I.Chem.E., F.I.Ceram.

LECTURER IN ELECTRICAL ENGINEERING

APPLICATIONS are invited for the post of full-time Lecturer in Electrical Engineering, to commence duties in September next.

Applicants should possess a degree or equivalent qualification and have had practical experience. Qualifications and experience in the field of measurements and electronics would be an advantage.

Burnham Salary Scale for Lecturers, £1,200 × £30 to £1,350.

Applications giving details of age, qualifications, training and experience, together with the names of two referees, should be sent to the Principal within 14 days of the appearance of this notice.

H. DIBDEN,
Clerk to the Governors.
3203

Situations Vacant (continued)

SOUTH OF SCOTLAND ELECTRICITY BOARD

Lanarkshire Area

1. **Second Assistant District Engineer (Coatbridge District).**
2. **Second Assistant District Engineer (Motherwell District).**
3. **Fourth Assistant Engineer (Test), Area Transformer and Protection Test Department, Motherwell.**
4. **General Assistant District Engineer (Lanark District).**

APPLICATIONS are invited for the above appointments. Candidates should have had a sound engineering training and should be Graduate Members of the Institution of Electrical Engineers, or hold equivalent qualifications.

The salaries and conditions of service will be in accordance with the National Joint Board agreement, Schedule A; the present classification and salaries will be as stated below. These posts are superannuable.

1. Second Assistant District Engineer (Coatbridge District).
2. Second Assistant District Engineer (Motherwell District).

Applicants for these appointments should have had experience in the operation and maintenance of overhead and underground H.V. and L.V. networks on a large distribution system and should be conversant with H.V. fault location, voltage drop and short circuit calculations, and load flow diagrams.

Classification, grading and salary for both appointments will be F.7, £885/£930 per annum.

3. Fourth Assistant Engineer (Test), Area Transformer and Protection Test Department, Motherwell.

Candidates for this appointment should have had experience in the commissioning and maintenance of modern protective equipment on a large distribution system and with the testing of power transformers. They should be conversant with the preparation of load flow diagrams and short circuit and voltage drop calculations.

Classification and grading will be L.13, salary £835/£880 per annum.

4. General Assistant District Engineer (Lanark District):

Applicants for this appointment should have had some experience on a large H.V. and L.V. distribution system, and should be conversant with voltage drop and short circuit calculations and load flow diagrams.

Classification and grading with be E.11, salary £635/£680 per annum.

The successful candidates for appointments Nos. 1, 2 and 4 will require to reside within a reasonable distance of their respective district offices and to take standby duty in accordance with the above agreement. The successful candidate for appointment No. 3 will require to reside within a reasonable distance of the transformer testing station at Motherwell.

Application forms, which may be obtained from the undersigned, should be forwarded to this office within 14 days of the date of this advertisement.

R. J. RENNIE,
154/156, Montrose Crescent, Manager.
Hamilton. 3211

LONDON ELECTRICITY BOARD

Engineering Draughtsman

APPLICATIONS are invited for the above position in the Regency District in Central London.

Applicants should have had a good general education, must be neat and accurate draughtsmen, and preferably should have had experience with an electricity supply authority in elementary building construction; electrical plant layout.

The post is graded under Schedule D of the National Joint Board Agreement as Grade 6, £635 to £755 per annum, inclusive of London allowance.

Application forms from Personnel Officer, 46, New Broad Street, London, E.C.2, to be returned completed by 5th May, 1958. Please quote ref. PER/2466/R. 3208

CITY OF SALISBURY, SOUTHERN RHODESIA

Electricity Undertaking

Vacancy for Test Room Assistant (Meters)

APPLICATIONS are invited for the fixed establishment post of TECHNICAL ASSISTANT, Grade 2, in the Test Section of the above-mentioned undertaking. Salary scale is £1,100 × £50 to £1,250 p.a., commencing salary at the minimum. No cost-of-living or other allowances are payable.

The income tax presently payable on the maximum salary for a married man with one child would be approximately £6.

Applicants must be thoroughly experienced in all types of meter testing, particularly high-tension, transformer-operated, polyphase equipments, both kW and kVA, and should be capable of carrying out all duties in connection with a standardising laboratory.

The main duties of this post are :—

(a) Testing and calibrating high-tension and special types of metering.
(b) Standardising instruments and substandard meters against potentiometer equipment.
(c) Ratio and phase angle testing of instrument transformers.
(d) Testing all types of instruments and meters, and general supervision of metering work.

The successful candidate must be able to comply with the requirements of the Immigration Authorities, and will be required to submit to the Council a satisfactory medical certificate of fitness.

Applicants should submit full particulars of their technical education, qualifications (if any), training and experience. Details of age, place of birth, nationality and marital state should be given, and copies of not more than three recent testimonials may be included.

Further particulars regarding conditions of service, leave entitlement, allowances toward travelling and removal expenses, etc., are obtainable from Davis & Soper Ltd., 52/54, St. Mary Axe, London, E.C.3, to whom applications must be submitted on or before 23rd May, 1958,

14th April, 1958. 3170

SOUTH WALES ELECTRICITY BOARD

APPLICATIONS are invited for the following positions based at Cwmbran in the Eastern Sub-Area of the Board :—

(a) SENIOR ASSISTANT ENGINEER (Construction).
Salary Class K, Grade 4 (£1,435/£1,540).
(b) SECOND ASSISTANT ENGINEER (Planning).
Salary Class K, Grade 7 (£1,160/£1,235).
(c) THIRD ASSISTANT ENGINEER (Construction).
Salary Class K, Grade 10 (£935/£995).
(d) THIRD ASSISTANT ENGINEER (Substations).
Salary Class K, Grade 10 (£935/£995).

The salaries mentioned above are in accordance with the National Joint Board Agreement for the Electricity Supply Industry.

Applications stating age, present position and salary, qualifications, experience, and three referees, should be addressed to the Secretary (Establishments Section), St. Mellons, Cardiff, so as to reach him not later than Saturday, 3rd May, 1958. 3190

MINISTRY OF TRANSPORT AND CIVIL AVIATION

requires ELECTRICAL ENGINEERS (Assistant Signals Officers) for aviation telecommunications and electronic navigational aids. Minimum age 23, 1st or 2nd Class Degree in Physics or Engineering, or A.M.I.E.E., or A.F.R.Ae.S. (candidates with Parts I, II and III of A.M.I.E.E. or Parts I and II of A.F.R.Ae.S. or equivalent, or of very high professional attainment without these qualifications considered).

Salary £665 (age 23) to £1,085 (age 34). Maximum £1,250. Slightly lower outside London and for women. 5-day week.

Further details and forms from M.L.N.S., Technical and Scientific Register (K), 26, King Street, London, S.W.1, quoting D129/8A. 252

YORKSHIRE ELECTRICITY BOARD

No. 6 (Hull) Sub-Area

GOOLE DISTRICT. SECOND ASSISTANT DISTRICT ENGINEER.

Applicants should have had sound practical experience in the operation, maintenance, planning and construction of H.V. and L.V. underground and overhead lines and substations in an extensive rural area.

Preference will be given to candidates who have the Higher National Certificate in Electrical Engineering or possess equivalent qualifications.

The successful candidate will be required to undertake standby duty and to reside in Goole or near vicinity.

Salary N.J.B. Class E, Grade 7, £835/£15/£880 per annum.

Applications giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to The Manager, No. 6 (Hull) Sub-Area, Yorkshire Electricity Board, Ferensway, Hull, not later than 9th May, 1958. 3210

IMPERIAL CHEMICAL INDUSTRIES LIMITED

Wilton Works, Middlesbrough

has vacancies for

ASSISTANT TECHNICAL OFFICERS FOR ENGINEERING DESIGN.

The scene of Britain's largest chemical project, Wilton Works, is on a 2,000-acre site near the Cleveland Hills. Development consists of building plants which embody the most up-to-date designs of building, civil engineering and mechanical engineering, including a complete power station. It also includes electrical engineering in a wide variety covering the generation, distribution, power and lighting installations.

Applications are invited from men who possess Higher National Certificates or its equivalent who are experienced in

ELECTRICAL DESIGN.

After joining the staff, married men receive a reasonable refund of removal and travel expenses, and facilities are available in approved cases for substantial loans for house purchase; legal charges will also be advanced. A lodging allowance will be paid to married men selected, whilst they are maintaining two homes.

Please write to me :—

Staff Manager,
Imperial Chemical Industries Limited,
Wilton Works, Middlesbrough,
Yorkshire,

quoting reference 492/6.

3105

ELECTRICAL DESIGNER

required for progressive position in London drawing office of Molins Machine Co. Ltd., inventors and manufacturers of automatic machinery.

Applicants should be aged 25-40, with technical qualification at least up to H.N.C. level, and with broad background of experience in the design of electrical and electro-mechanical equipment as applied to precision machinery.

Write in confidence — Personnel Manager, Evelyn Street, London, S.E.8.

3165

SOUTH OF SCOTLAND ELECTRICITY BOARD

Glasgow Area

Third Assistant District Engineer, Central District

APPLICATIONS are invited for the above position. Candidates should have a sound engineering training and subsequent experience with H.V. and L.V. underground distribution systems, including the operation and maintenance of H.V. and L.V. switchgear and cables and a knowledge of protective gear and fault location.

The possession of the Higher National Certificate or equivalent qualification is desirable.

Salary scale £885/£930 per annum, Class H, Grade 9.

The successful candidate will require to reside within reasonable distance of District Headquarters.

The conditions of employment will be in accordance with the National Joint Board Agreement and the post is superannuable.

Applications on the appropriate form, which may be obtained from the undersigned, should be completed and returned not later than 14 days from the appearance of this notice.

A. KELSO,
Manager.

P.O. Box 6,
75, Waterloo St., Glasgow, C.2.
15th April, 1958. 3174

The Electrical Division

of

FAWCETT PRESTON & CO. LTD.

Bromborough, Cheshire

invites applications for the following appointments :—

SALES ENGINEER

aged 25/30 years, to operate as an outside Sales Representative for the company's resistor production and associated items.

DESIGN AND DEVELOPMENT ENGINEER

to be engaged on both standard design work and special development of resistors and associated equipment.

Applicants must hold Higher National Certificate (Electrical).

In both cases preference will be given to applicants with experience on industrial and traction resistors.

Apply with full details of qualifications and experience, stating present salary, to Personnel Officer, Fawcett Preston & Co. Ltd., Dock Rd., Bromborough, Cheshire. 3107

THE GENERAL ELECTRIC COMPANY LIMITED

have vacancy for an

OPERATING ENGINEER

for the

Operational Service Department of their Turbine Division at Erith, Kent.

The post involves site investigations and applicants must have good all-round power station operating experience. Minimum qualification H.N.C.

Apply giving age and experience to Personnel Manager (T), The General Electric Company Limited, Erith, Kent. 3106

CENTRAL ELECTRICITY GENERATING BOARD

London Division

APPLICATIONS are invited for following superannuable posts. Conditions of service in accordance with N.J.B. Agreement, Schedule A. Salary includes London allowance. Qualifications entitling to Graduate Membership of I.E.E. or I.Mech.E. an advantage.

ASSISTANT ENGINEER (R. & M. Planning), FULHAM POWER STATION (Vacancy No. 58/270).

Sound technical training with experience in planned mechanical maintenance of large power station plant. Salary Class K, Grade 12 = £885 p.a.

STATION SHIFT CONTROL ENGINEER, FULHAM POWER STATION (Vacancy No. 58/271).

Good technical training with experience in control and isolation of E.H.T. main switchgear and control and operation of steam generating plant. Salary Class K, Grade 10 = £985 plus £93 10s. shift p.a.

ASSISTANT ENGINEER (Technical), TAYLORS LANE POWER STATION (Vacancy No. 58/272).

To assist generally in power station technical matters. Salary Class F, Grade 14 = £580 per annum.

Applications, quoting vacancy number, to (or on form from) Central Electricity Generating Board, London Division, P.O. Box 136, London, W.1, by 5th May, 1958. 3175

CENTRAL ELECTRICITY GENERATING BOARD

East Midlands Division

APPLICATIONS are invited for the following vacancy in this Division :—

DEPUTY STATION SUPERINTENDENT, CASTLE DONINGTON POWER STATION (Vacancy No. 73/58/ER).

Applicants should preferably be Corporate Members of the Institution of Mechanical and/or Electrical Engineers and have had experience in a responsible position in a power station equipped with high pressure plant including pulverised fuel boilers.

Salary will be in accordance with Class L, Grade 3 of the National Joint Board Agreement, £1,685 to £1,790 per annum.

Closing date for receipt of applications, 5th May, 1958.

This appointment will be pensionable within the provisions of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT, which may be obtained from the Divisional Establishments Officer, Central Electricity Generating Board, East Midlands Division, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated. PLEASE QUOTE VACANCY NUMBER.

L. F. JEFFREY,
Divisional Controller.

SOUTH EASTERN ELECTRICITY BOARD

CARTOGRAPHIC DRAUGHTSMAN, Tunbridge Wells. Salary £615 × £20 to £675 p.a. under N.J.C. Grade 2.

Preference to applicants with experience in the preparation of mains record plans, reproduction of O.S. Maps and general D.O. routine.

Applications naming two referees, to T. W. Dann, M.Eng., M.I.E.E., Tunbridge Wells Manager, SEEBOARD, Town Hall, Tunbridge Wells, by 7th May, 1958.

THIRD ASSISTANT DISTRICT ENGINEER, Tunbridge Wells District. Salary £835 × £15 to £880 p.a., under N.J.B. Class F, Grade 8.

Candidates should preferably have the Higher National Certificate or equivalent and practical experience in the operation, maintenance and construction of M.V. and 11 kV underground and overhead systems. The successful candidate will be required to undertake standby duties and reside in or near Tunbridge Wells.

Applications naming two referees, to T. W. Dann, M.Eng., M.I.E.E., Tunbridge Wells Manager, SEEBOARD, Town Hall, Tunbridge Wells, by 7th May, 1958.

GEORGE WRAY,
Secretary.

CENTRAL ELECTRICITY GENERATING BOARD

Nuclear Operations Branch

APPLICATIONS are invited for appointments in the newly formed Nuclear Operations Branch at Headquarters, Bankside House, London, S.E.1.

The successful applicants will be concerned with work on fuel cycles and investigating the behaviour of nuclear reactors under operational conditions. This work will be carried out initially at headquarters with a view to undertaking similar work in civil nuclear power stations as they are commissioned. Those appointed will be required to attend a course at the Harwell Reactor School and probably undergo a training period with the Industrial Group of the United Kingdom Atomic Energy Authority before taking up final appointments. Candidates should hold a good degree in Engineering, Physics or Maths.

Salaries within scales £1,435-£1,795 p.a., £1,210-£1,570 p.a., £1,105-£1,315 p.a., £870-£1,045 p.a., according to qualifications and experience.

Write for application form to S. S. Scott, Chief Personnel Officer, 24/30, Holborn, London, E.C.1, to be returned by not later than 12th May. Envelopes should be marked "Confidential," quoting reference ER/110. 3188

CHIEF DRAUGHTSMAN MOTOR CONTROL GEAR

ESTABLISHED and expanding firm of control gear manufacturers invite applications for the post of CHIEF DRAUGHTSMAN.

Applicants should have had extensive practical experience in the design, layout and development of multi-motor control boards, particularly as regards equipment built to meet customers' special requirements, and be capable of carrying full responsibility for drawing office output and personnel.

Essential qualities are initiative, ability to organise, and a systematic approach.

Applicants should be between the ages of 30 and 45.

Apply in writing, giving details of age, experience and qualifications, to the Secretary, Morecambe Electrical Equipment Co. Ltd., Westgate Works, Morecambe, Lancs. 3227

LOUGHBOROUGH COLLEGE OF TECHNOLOGY, LEICESTERSHIRE

APPLICATIONS are invited for the following positions:—

Department of Electrical Engineering:

(a) SENIOR LECTURER IN ELECTRICAL ENGINEERING.

(b) LECTURER IN ELECTRICAL ENGINEERING.

Applicants should be fully qualified electrical engineers having experience or special interest in one or more of the following branches:—

Electrical Measurement.
High Voltage Techniques.
Utilisation of Electrical Power.
Electrical Plant.

Department of Mechanical Engineering:

(c) LECTURERS IN MECHANICAL ENGINEERING (three vacancies).

Applications should be fully qualified mechanical engineers, preferably having had recent industrial experience.

Salary scales, Senior Lecturer, £1,350 × £50 to £1,550 p.a.
Lecturers, £1,200 × £30 to £1,350 p.a.

Commencing salaries will be determined by previous educational and industrial experience.

Both research and co-laboration with industry are encouraged.

Further particulars and forms of application may be obtained from the Registrar. (In reply please quote 17/A.E.) 3206

Situations Vacant (continued)

SENIOR SALES REPRESENTATIVE

A LEADING firm of electrical and electronic equipment manufacturers in the London area will shortly appoint a SENIOR SALES REPRESENTATIVE. This post will be concerned primarily with high level liaison and negotiations aimed at expanding sales with British Railways, G.P.O. and other public undertakings.

The company manufactures a wide range of products and aims at further development in, particularly, the electronics field. Consideration in making the appointment will be given to level of personal contacts, record of negotiating contracts, knowledge of British Transport and other public undertakings' organisation and procedures; to experience in signals, telecommunications and electronics generally; and to academic standards, which should be equivalent to good honours degree level. Preference will be given to those aged 35 to 45. The salary will be commensurate with the successful candidate's qualifications for the post and with the responsibilities involved. Only those now earning in the region of £2,000 p.a. should apply.

Applications, detailing age, qualifications and career, should be sent to "E. G. D." c/o R. Anderson & Co., 14, William IV St., London, W.C.2. 3177

CENTRAL ELECTRICITY GENERATING BOARD

Engineer, Research Laboratories

ENGINEER required in MECHANICAL ENGINEERING SECTION of RESEARCH LABORATORIES, LEATHERHEAD, SURREY, to undertake theoretical and experimental stress analysis on a variety of problems encountered in the generation and transmission of electricity, including thermal stress in reactor shielding and steam piping. Candidates must possess initiative and be prepared to design and instrumentate their own test apparatus.

An Honours Degree in Engineering or Physics is required, and preferably some industrial or research experience.

Salary within scales: £1,160-£1,510; £1,055-£1,265; £820-£995 per annum, according to qualifications and experience.

Applications stating age, qualifications, experience, present position and salary should be forwarded to S. S. Scott, Chief Personnel Officer, 24-30, Holborn, London, E.C.1, by 17th May. Envelopes should be marked "Confidential," quoting reference ER/107. 3168

JOSEPH LUCAS (ELECTRICAL) LTD.

ASSISTANT ELECTRICAL DESIGN ENGINEER

required for the design of rotating electrical equipment. Candidates should have Higher National Certificate, preferably some works training, and drawing office and design experience with small A.C. and D.C. machines. The position covers work on a wide range of machines, carries a good starting salary, and provides excellent prospects for advancement.

Five-day week. Staff pension fund.

Apply, in writing, giving details of age, qualifications and experience, to the Personnel Manager, Joseph Lucas (Electrical) Limited, Great King Street, Birmingham, 19, quoting reference PM/D/208.

127

DRAUGHTSMEN

Seniors and Juniors, required for design and detail of medium-voltage electrical switch and control gear for electricity boards, oil refineries, N.C.B. and industrial installations. Men holding or studying for O.N.C. and having D.O. experience in the above class of work preferred. Excellent working conditions, 5-day week. Contributory superannuation plus free life insurance. Applications treated in strict confidence.

Apply stating age, qualifications and salary desired to Secretary, M. & C. Switchgear Ltd., Kirkintilloch, Nr. Glasgow. 3072

ROYAL NAVAL SCIENTIFIC SERVICE

PHYSICISTS, ELECTRONIC ENGINEERS and MATHEMATICIANS required for 25 Senior Scientific and Scientific Officer posts at establishments in London area, Baldock, Harwell, Haslemere, Poole, Greenock and Rosyth. Also MECHANICAL ENGINEER for work on heat transfer problems at Harwell. MECHANICAL ENGINEER for work on fuel and lubricating oil problems in London area. MECHANICAL ENGINEER for work on gas turbine problems in London area. CHEMICAL ENGINEERS for London area and Poole. METALLURGISTS for Rosyth and Poole. CHEMISTS (physical and inorganic) for Poole and Baldock.

Candidates must normally be natural-born British subjects of natural-born British parents, with at least First or Second Class Honours degrees or equivalent high professional attainments. S.S.O.s must have had at least three years' postgraduate experience and be 26 years of age.

Salaries (men): S.S.O. £1,190-£1,410; S.O. £635-£1,110 (London); somewhat lower in Provinces. Appointments are unestablished (with F.S.S.U. benefits), but opportunities may occur for those under 32 to compete for established posts.

Forms from M.L.N.S., Technical & Scientific Register (K), 26, King Street, London, S.W.1, quoting A.98/8A. 2807

THE ELECTRIC CONSTRUCTION COMPANY LIMITED

Bushbury Engineering Works
Wolverhampton

Attractive Vacancy for

SENIOR ASSISTANT SALES ENGINEER

for the Midlands Area.

Experienced in the layout of rotating electrical plant (medium and large), automatic control gear, H.T. and L.T. switchgear, rectifiers, power transformers.

The position carries excellent prospects. Valuable pension scheme in operation.

SALES EXPERIENCE ESSENTIAL.

Write, giving full details, to the above address (quoting "AW/Sales Engineer" in top left-hand corner).

3172

PATENT OFFICE: EXAMINERS
(Men and Women)

for scientific, technical and legal work on patent applications. Age between 21 and 35; extension for regular Forces service and Overseas Civil Service. Qualifications: normally first or second class honours degree in physics, chemistry, engineering, metallurgy or mathematics, or equivalent attainment, or professional qualification, e.g., A.M.I.C.E., A.M.I.Mech.E., A.M.I.E.E., A.R.I.C.

London salary (men) £635-£1,410; provision for starting pay above minimum. Good promotion prospects.

Apply Civil Service Commission, 30, Old Burlington Street, London, W.1, for application form, quoting S128/58 and stating date of birth. 3167

COUNTY BOROUGH OF EAST HAM

East Ham Technical College

APPLICATIONS are invited for the following new post in the Department of Engineering:—

LECTURER in Electrical Engineering with suitable industrial and teaching experience to develop the heavy current work and to teach up to H.N.C. standard. Graduate qualifications desirable.

Burnham salary scale £1,200 × £30 to £1,350 plus London allowance of £36 or £48.

Forms of application (returnable by 9th May, 1958) from the Chief Education Officer, Town Hall Annexe, Barking Road, London, E.6. 3164

SOUTH WALES ELECTRICITY BOARD

APPLICATIONS are invited for the following positions in the Eastern Sub-Area of the Board:—

(a) GENERAL ASSISTANT ENGINEER (Construction), Eastern Sub-Area (Cwmbran).
Salary Class K, Grade 13 (£790-£835).

(b) FOURTH ASSISTANT ENGINEER, District 462 (Newport).
Salary Class G, Grade 11 (£740-£785).

(c) FOURTH ASSISTANT ENGINEER, District 461 (Pontypool).
Salary Class F, Grade 11 (£685/£730).

The salaries mentioned above are in accordance with the National Joint Board Agreement for the Electricity Supply Industry.

Applications stating age, present position and salary, qualifications, experience, and three referees, should be addressed to Mr. D. G. Gwyn, Sub-Area Manager, Eastern Sub-Area, Albany Chambers, Skinner Street, Newport, Mon., so as to reach him not later than Saturday, 3rd May, 1958. 3189

BRUSH ELECTRICAL ENGINEERING COMPANY LIMITED

invite applications for positions as

TENDER AND CONTRACT ENGINEERS

to be located in their Birmingham and Manchester offices.

Successful applicants will be responsible for preparation of tenders for standard switchgear up to and including 11,000 volts.

Interviews will be arranged in Birmingham and Manchester on a Saturday morning if required.

Applicants should give particulars of past experience, qualifications, etc., and should be addressed to the Chief Personnel Officer, Brush Electrical Engineering Company Limited, Loughborough, Leics.

3130

JOSEPH LUCAS
(ELECTRICAL) LIMITED

Great King Street, Birmingham, 19

ENGINEER

EXPANSION of development of ignition equipment for gas turbines and allied projects creates a vacancy for a practical engineer with experience of design for economic production of electrical apparatus. The work is of a high technical standard and applicants should preferably possess an honours degree.

The post is permanent and pensionable and offers considerable scope for advancement to a progressive engineer.

Apply in writing stating age, qualifications and experience to the Personnel Manager, Joseph Lucas (Electrical) Ltd., Great King Street, Birmingham, 19, quoting reference PM/D/190.

128

THE LIVERPOOL ELECTRIC CABLE CO. LTD.

Linacre Lane, Bootle, Liverpool, 20

require an Electrical Engineer for a senior executive position. Experience in paper, rubber or plastic cables desirable. Salary dependent upon age, qualifications and experience.

Replies to be addressed to the Technical Director.

3069

REPRESENTATIVE

with a knowledge of selling electric cookers and fires required for Scotland. Applicants, who should preferably not be over 40, should have a good personality and education, be a car owner, and have sound contacts with the Area Boards, electrical wholesalers and retailers in the area.

Write giving age, qualifications and experience to :—

BELLING & CO. LTD.
Bridge Works, Enfield, Middlesex
3191

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

SECTION ENGINEER required in the Liverpool Central District. Salary within range £1,065/£1,140 per annum (N.J.B. J/7).

Applicants should have had experience in the construction, operation and maintenance of systems up to and including 33 kV. Technical qualifications desirable.

Special forms of application obtainable from the Manager, No. 1 Sub-Area, 24, Hatton Garden, Liverpool, 3, should be returned not later than 9th May, 1958. 3207

CONTROL GEAR SALES ENGINEER

required for North-West. Knowledge of associated equipment and outside sales experience essential. Pension fund.

Applications, marked "Confidential," and stating experience, qualifications, age and salary required, to :—

Area Sales Manager
BRITISH KLOCKNER SWITCHGEAR LTD.
Cromford House, Cromford Court
Manchester, 4
3052

DESIGNER/DRAUGHTSMAN

with experience in design of air break circuit breakers up to 2,000 amperes for medium-voltage A.C. applications and complying with B.S. and A.S.T.A. requirements. Position offers excellent opportunity for man with initiative capable of accepting responsibility and working with minimum supervision. Salary commensurate with experience and technical qualifications. Applications treated in strict confidence. —Box "071.

A COMPANY of the Expert Tool Group requires senior designer-draughtsmen experienced in the design of contactors allied to the motor control gear field. Salary will be paid commensurate with qualifications and experience. Assistance with housing to suitable applicants. Write stating full details to—Chief Draughtsman, Sharp Control Gear Ltd., Lount Works, Ashby-de-la-Zouch, Leics. 3121

ARMATURE winder. Progressive firm have vacancy for skilled man having sound knowledge all types A.C. and D.C. work.—Service Electric Co. Ltd., Honeypot Lane, Stanmore, Middx. (Edgware 5566). 3054

ARMATURE winders: Working foreman and winder required. Sound knowledge A.C. and D.C. work. Uxbridge area.—Box 3015

ASSISTANT engineer required with experience in the design and layout of automatic control and switchgear. Apply in confidence—Electro Dynamic Construction Co., Ltd., Control Gear Division, Bristol Road, Bridgwater, Somerset. 3212

COMMISSIONING engineer, aged 35 to 50 years, with wide experience of commissioning of power station plant or similar heavy industrial plant. To be responsible to chief engineer for formulating and implementing a comprehensive commissioning programme for complete nuclear power station. Must be willing to travel and capable of accepting major responsibility. This is a senior and pensionable post. Minimum qualification A.M.I.Mech.E., A.M.I.E.E. or equivalent. Applications giving age, details of education, qualifications and experience to — Chief Resident Engineer, The General Electric Co. Ltd., Hunterston Nuclear Generating Station, West Kilbride, Ayrshire. 3192

CONTROL gear engineer required, age 23-35, for layout and circuiting of contactor equipment. Good salary. Permanent and progressive position. Canteen, pension scheme. Write stating age, experience and qualifications, if any, to Personnel Officer, Dewhurst & Partner Ltd., Inverness Road, Hounslow, Middlesex. 273

BRITISH ENGINE BOILER & ELECTRICAL INSURANCE Co. Ltd., 24, Fennel Street, Manchester, 4. A vacancy has arisen for an electrical surveyor. Permanent position carrying progressive salary scale £735 to £1,060 and non-contributory pension. Candidates, age 26 to 32, preferably with H.N.C. in Electrical Engineering or Grad. I.E.E., and with apprenticeship in manufacture or repair of electrical machinery, are invited to apply in own handwriting, stating age, qualifications and experience. 3178

DESIGN draughtsmen required in London by consulting engineers. Must have experience lighting/power layouts for large buildings, factories, airfields, etc. Permanent posts with good prospects and generous salaries. Contributory pension scheme and five-day week. —Box 3095.

DESIGNER-draughtsman, senior, electrical, required. Experience is preferred in the application of diesel-driven generating machinery up to 200 kW and its associated control gear, including portable, standby, automatic mains failure equipment, etc. Experience essential in control gear and circuit layout. Good salary offered. Pension scheme. Canteen facilities. Reply for the attention of the Chief Engineer, Henry Meadows Limited, Fallings Park, Wolverhampton. 3179

ELECTRICAL contractors, S.E. Essex, require working foreman electrician. Must be good tradesman, capable supervising small contracts. Driving licence. Domestic and industrial installations. State age, training and experience.—Box 9337.

ELECTRICAL engineer required by old-established electrical contractors to take charge and develop Northern branch. Applicants must be experienced in estimating, supervision of labour and administration. State age, experience and salary required to—Box 3108.

ELECTRICAL engineering assistant. Littlewoods Mail Order Stores Ltd. require an electrical engineering assistant for their Construction Department in Liverpool. Applications are invited from men (not over 35 years of age) experienced in the preparation of plans and specifications for extensive lighting installations in large stores, factories, etc., and able to supervise all classes of electrical work. 1st Class City and Guilds required. The appointment, due to expansion within the organisation, offers real scope for a keen, enthusiastic man. Good commencing salary according to experience and qualifications. Life assurance and pension scheme. Five-day week. Letters of application, giving age and full particulars, to—Employment Manager (E.E.A./2), Littlewoods Mail Order Stores Ltd., Kershaw Ave., Crosby, Liverpool, 10. 3216

ELECTRICAL engineering draughtsmen required for complete electrical installation and design work, including motor application and control scheme engineering. Top salaries, pension scheme, living allowance until removal effected, removal expenses paid and assistance in housing. Apply—The Power Gas Corpn. Ltd., Stockton-on-Tees. 3093

ELECTRICAL engineers. Juniors 20/24 years required to assist in the preparation of control schemes and specifications for electrical equipment for mechanised electric and gas-fired heat treatment furnaces and for induction heating equipment. O.N.C. or H.N.C. in Electrical Engineering desirable, according to age. Apply by letter to—Personnel Manager (F.C.), Birlec Ltd., Tyburn Road, Erdington, Birmingham. 3214

ELECTRICAL or mechanical engineer wanted by large German company for German-English translations. Applications are invited from British-trained engineers with a good knowledge of German who have an inclination towards translation work and desire to work in a pleasant environment in Germany for at least 2 to 3 years. Write stating age, education, experience and salary to—Box 3030.

ELECTRICIAN required by private company in S.E. London for maintenance work. Capable of working on own initiative and able to deal with industrial machinery.—Box 3074.

ELECTRO-mechanical draughtsmen required for production drawing office of company engaged in the manufacture of control gear equipment. Good salaries paid to "first-class" men. Canteen facilities, pension scheme. Housing assistance considered in approved cases. Write giving age, experience, etc., to—Personnel Officer, Dewhurst & Partner Ltd., Inverness Works, Inverness Road, Hounslow, Middx. 275

EXPERIENCED draughtsmen of O.N.C. or H.N.C. standard required for interesting design work on process plant and machinery. A good technical background and knowledge of machine design is essential, and applicants should be qualified to H.N.C. standard. Salaries are assessed in accordance with age, qualifications and experience and will be reviewed annually. Contributory superannuation and widows' pension fund are in operation, and there are excellent canteen, welfare and recreational facilities. Applicants should apply in writing to Group Personnel Department, Pilkington Brothers Limited, Grove Street, St. Helens, enclosing a brief history of their career and details of their education and qualifications. 3096

FOREMAN, first-class electrical installation work, required by large firm electrical engineers and contractors. Excellent opportunity. Write age, experience, copy references.—Box 3193

JUNIOR technical assistant required with transformer design and drawing experience. Excellent prospects and housing available. Apply—Works Director, The Transformer & Electrical Co. Ltd., Honywood Road, Basildon, Essex. 3217

KEEN young man required with connections in electrical wholesale trade to take over and develop existing territory in South-West representing well-known conduit fittings manufacturers. This can be a rewarding position for man prepared to work hard. Salary and expenses, preferably own car. Write in first instance giving age, education, experience, etc., to Sales Manager.—Box 3196.

L.T. linesman/jointer required by the Jersey Electricity Co. Ltd. Applicants must be adaptable, fully experienced, and aged 25/35. 5-day, 44-hour week, 54.5d. per hour. Non-contributory pension scheme. Brief particulars of training and experience should be included in applications addressed to — The General Manager, The Jersey Electricity Co. Ltd., 11, Broad Street, St. Helier, Jersey, C.I. 3123

MACHINE designer required by North-East Coast firm for their development department. Experience in design of squirrel cage and slipring motors essential. Experience in design of alternators an advantage. An interesting position offering good prospects at a salary commensurate with age, experience and qualifications. Please write to—Box 3153.

MANAGER. Electrical contractors engaged on installation contracts for large office blocks, schools, flats and industrial buildings require a capable and experienced manager. Applicants should have sound practical knowledge estimating and possess good technical administrative and negotiating ability with capacity for assuming full responsibility and control. Pension scheme, attractive conditions and excellent prospects to selected applicant. State age, qualifications, experience, present salary, availability.—Box 3194.

REPRESENTATIVE required by electrical wholesalers to cover western half of Devon. Applicant must have connections amongst electrical contractors and industrial buyers in the area, and be accustomed to handling large turnover. First-class service and backing provided. Remuneration by salary and commission. All expenses paid. Superannuation scheme. Write—Branch Manager, Simpson, Baker & Co. Ltd. 2/4, Smythen St., Exeter. 3218

REPRESENTATIVE resident Bristol area for S.W. England and S. Wales for Temco wiring accessories. Good salary, commission, expenses for experienced man with personality and contractor connection. Car provided. Pension scheme. Holiday arrangements respected. Write in confidence stating experience, age, remuneration required, to Mr. S. M. Harris, T.M.C.-Harwell (Sales) Ltd., 37, Upper Berkeley Street, London, W.1. 3195

SALES engineer required for electrical division of company manufacturing generating sets up to 160 kW output. Applicants should have Higher National Certificate in Electrical Engineering or equivalent. The commencing salary will be commensurate with experience and qualifications and there will be ample scope for advancement. Applications will be treated as confidential and should be made in writing giving full details of age, experience and qualifications, to—Sales Director, Henry Meadows, Ltd., Fallings Park, Wolverhampton. 3155

SENIOR engineer required by well-known London electrical contractors. Write giving full particulars.—Box 3001.

Situations Vacant (continued)

SALES engineers for electric motor manufacturers for London and Midland areas. Permanent and progressive appointments, superannuation scheme, salary, commission and expenses. Apply in confidence giving full details of previous experience, age and salary.—Box 3219.

SALES order clerk required. Senior post, well paid position offering scope in the future. Superannuation scheme, canteen and social club facilities. Experience of electrical wholesaling essential. Apply to — Managing Director, Halsey's Electric Co. Ltd., Brandon House, Wyfold Road, London, S.W.6 (Fulham 3355). 2949

SENIOR design development engineer required by well-known progressive manufacturer of rotating electrical equipment. Real opportunity for a younger man with ability and experience. Full details of qualifications, experience, salary and age.—Box 3224.

SENIOR transformer estimating engineer, aged 25-35, required. Applicants should be of H.N.C. standard with experience in this field. Alternatively, an engineer with good electrical engineering experience preferably, but not essentially, in transformers would be acceptable. This position involves some customer contact and offers good prospects in a rapidly developing group of companies. Apply with full details of career and salary required to—Personnel Officer, Gresham Transformers Ltd., Twickenham Rd., Hanworth, Middlesex. 3180

TECHNICAL assistant to designer required (age 20/28). Should have some acquaintance with design of automatic electric motor control gear, also electronic and magnetic amplifiers. Progressive position, attractive salary, superannuation.—Box 3124.

TECHNICAL sales representative for Greater London and Home Counties. Generous salary/commission/expenses. Post last year worth over £1,300. Must own car. Pension scheme, five-day week. Only applicants with experience, initiative and dynamic personality will be considered. Full details to—Man. Dir., British Central Electrical Co. Ltd., 6, Rosebery Avenue, London, E.C.1. 3225

TRANSFORMER and tap changer design draughtsmen for layout and design of E.H.V. transformers and auxiliary equipment. Senior staff experienced in this type of work will be paid good salaries and the wage structure gives ample opportunity for advancement. The works and drawing offices are situated on the outskirts of London and the company is renowned for progressive design and quality of workmanship. Apply, giving details of age, experience, qualifications and salary required, to—Box 3181.

TRANSFORMER design engineer required who is interested in dealing with a wide range of design problems from instrument transformers to 3,000-kVA power transformers. Apply giving details of past experience, age and salary required to—Personnel Officer, Foster Transformer Ltd., London, S.W.19. 3182

TRANSFORMER designer and draughtsman, senior. Fully experienced on all types transformers up to 500 kVA. Commencing salary over £1,000 p.a. is envisaged. The appointment offers scope for advancement and will be progressive. Apply in the first instance in writing: Willesden Transformer Co. Ltd., Manor Park Road, Harlesden, London, N.W.10. 3077

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Dissatisfaction having so often been expressed that unsuccessful applicants are left in ignorance of the fact that the position applied for has been filled, may we suggest that Advertisers notify us to that effect when they have arrived at a decision? We will then insert a notice free of charge under this heading.

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BRITISH electrical engineer, B.Sc., A.M.I.E.E., retiring, aged 50, from post in India and Burma after 24 years' continuous service, seeks further employment.—Box 9340.

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GRAD. I.E.E., H.N.C. (35), distribution engineer with various electricity boards, all aspects of supply; construction, maintenance, operations, planning, costing, estimating; seeks post in industry, London area.—Box 9328.

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Area Manager.

Area Offices,
Millburn Street, Aberdeen.
16th April, 1958. 3198

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BROOK	110	400/440	960
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A.A. ELECTRICAL Co. for A.C.-D.C. motors, switchgear, exhaust fans, hoists, reduction gears, new or reconditioned units.—CHI. 5105. 67, Rothschild Rd., London W.4. 57

BABCOCK & Wilcox water tube boiler will cut down your fuel costs; we can supply from stock. Two 40,000 lb. evap., 220 lb. w.p.; one 25,000 lb. evap., 200 lb. w.p.; 3,000 lb. evap., 400 lb. w.p.; Spencer Bonecourt boiler; also Marine, Cornish vertical, etc.—Burford, Taylor & Co. Ltd., Boiler Specialists, Burtayco House, Church Street, Middlesbrough (Tel. Middlesbrough 2622). 122

A.C. and D.C. motors, generators, from stock.—Service Electric Co. Ltd., Honeypot Lane, Stanmore, Middx. (Edgware 5566/9). 91

A.C. and D.C. 1/- slotmeters. Guaranteed 2 years, 2½-50 amps. From 50/-. Repairs and recalibrations. See Billiard: Tradex Meter Co., Surbiton (Tel. Elmbridge 4487). 169

ALMOST new 10-h.p. Brook slipring motor, 710 r.p.m., 415/3/50, cont. rating, c/w starter, £50.—Axon Motor Re-winding Co. Ltd., 536, Moseley Road, Birmingham, 12. 3080

ALTERNATORS from ½ to 675kVA in stock, single and three-phase, all voltages and frequencies. Guaranteed. Many unused. Send your requirements.—Fyfe, Wilson & Co. Ltd., Station Works, Bishop's Stortford. 162

ALTERNATORS, generators, 1-100 kVA, all voltages. Specialists—Powerco Ltd., 312, York Rd., London, S.W.18 (VAN. 5234). 147

ALTERNATORS, 3-phase, all sizes in stock from 7 kVA up to 330 kVA.—Britannia Manufacturing Co. Ltd., 20/26, Britannia Walk, London, N.1 (CLErkenwell 5512). 24

BARGAINS in electric motors are always being obtained from A. Cooksley & Co. Ltd., 21/25, Tabernacle Street, London, E.C.2. Stocks include A.C. and D.C. motors, second-hand and new up to 30 h.p. Starters, slide rails and pulleys. Ring Mon. 3355 for your requirements. 50

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BRAND new 7½-h.p. E.E.C. slipring motor, 400/3/50, 950 r.p.m., cont. rating, c/w starter, £55.—Axon Motor Re-winding Co. Ltd., 536, Moseley Road, Birmingham, 12. 3079

CABLE, underground, all types ex stock.—E. M. Tatton Co. Ltd., Kew Bridge, Brentford (EALing 3155/6). 117

CABLE, underground, PILC/VIR/LC, ex London stock. Cutting orders same day delivery London area. Send for priced stock lists.—Batt Electrical Co., 6, Dock Street, London, E.1 (Tel. ROYal 5905). 316

CIRCUIT breakers, various sizes in stock, A.C. and D.C., 200 amperes up to 2,000 amperes. Also dynamo and alternator switchboards.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 26

CONVERTERS and motor-alternators, 24, 110 and 220v. D.C. to 230/1/50 A.C., 125 watts to 6 kVA in stock.—Powerco Ltd., 312, York Rd., London, S.W.18 (VAN. 5234). 150

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DIESEL generating sets, all sizes to 500 kW. Britannia Mfg. Co. Ltd., Britannia Walk, London, N.1. 16

ELECTRIC motors, generators, control gear, transformers, A.C. and D.C., new and reconditioned; all covered with our usual 12 months' guarantee; large stocks available.—Electropower Co. Ltd., Kingsbury Works, Kingsbury Road, London, N.W.9 (Colindale 4621-2). 42

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ELEVEN D.C. electric motors with starters, ½ h.p. to 10 h.p. Apply—Estate Office, Sandringham, Norfolk. 3160

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FLUORESCENT fittings, lamps, starters and control gear for home and export. Fully guaranteed by actual manufacturers. Send for catalogues. — The Anglo-American Electrical Company, Olive Street, Bury, Lancs. 245

FLUORESCENT tubes reconditioned and guaranteed as new for 7s. 6d. each. Free collection and delivery in Lancs and Yorks.—The Anglo-American Electrical Company, Bury New Road, Breightmet, Bolton, Lancs. (Telephone, Bolton 7251). 212

FRACTIONAL h.p. motors, new, ex stock, A.C./D.C., Universal, B.T.H., Delco-Remy, G.E.C., Fracmo, Newman, Scophony. — Jeary Electrical Co. Ltd., 5, Lamb's Buildings, London, E.C.1. 126

FREQUENCY changers and variable frequency M/A sets in stock, and to specification.—Powerco Ltd., 312, York Rd., London, S.W.18 (VAN. 5234). 148

GENERATING plants of all types, new and reconditioned up to 100 kVA in stock. Special plants built to order at short notice; automatic mains failure, etc.—Powerco Ltd., 312, York Rd., London S.W.18 (VAN. 5234). 151

GENERATING sets for sale, petrol, diesel and steam, from 1 kW up to 700 kW. A.C. and D.C. switchboards.—Fyfe, Wilson & Co. Ltd., Station Works, Bishop's Stortford. 163

HIGH frequency alternators and converters, 400 to 2,600 cycles up to 6 kVA in stock. Powerco Ltd., 312, York Rd., London, S.W.18 (VAN. 5234). 149

HOUSE service meters, C. & H., Aron, E.A.C., 20-240 v. A.C., s.-ph., 50 c., 5 amps., 17s. 6d.; 1s. 6d. postage.—Universal Electrical, 217-221, City Rd., London, E.C.1. 37

MOTOR generator sets and converters, all sizes and voltages from ½kW up to 500kW in stock. — Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, City Road, London, N.1 (Tel. Clerkenwell 5512, 5513 & 5514). 12

MOTOR generators of all types in stock and to specification up to approx. 100 kW.—Powerco Ltd., 312, York Rd., London, S.W.18 (VAN. 5234). 152

MOTORS, starters, circuit breakers. Huge stocks of all types, ¼ to 300 h.p. Stock list or quote by return.—J. S. Ramsbottom & Co. Ltd., Bow St., Keighley (3774-5-6). 70

NAMEPLATES, engraving, diesinking, stencils. — Stilwell & Sons Ltd., 153, Far Gosford Street, Coventry. 108

NEW ironclad fuseboard, G.E.C., 60 amps., 6-way, T.P., £4 10s.; G.E.C., 30 amps., 6-way, T.P., £3 5s.; Revo, 15 amps., 6-way, T.P., £2; new anodized brass, cord grip, push-bar lampholders, 9s. 6d. per dozen; 400 new galvanized 3½" 'D' irons, £10; 600 new 1½" porcelain bobbin insulators, £6; new M.E.M. 5-amp., 2-way ironclad switches, 2s. each.—G. F. Walker & Son, 60, June Avenue, Leicester (Syston 3198). 9339

PHASE converters, single to three-phase, several sizes in stock up to 90 h.p., 3-phase loading. — Britannia Mfg. Co. Ltd., Britannia Walk, London, N.1. 29

PLATING dynamos and motor generator sets, various sizes from 500 amps. up to 2,000 amps., with A.C. or D.C. motors.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 15

POLYPHASE kilowatt hour meters. Available from stock.—Universal Electrical, 221, City Road, London, E.C.1. 40

PREPAYMENT 1s. slot house service meters. —Universal Electrical, 217-221, City Road, London, E.C.1. 36

PURLEY chokes and ballasts. Our 80-w. tapped h.p.f. ballast with starter switch-holder incorporated is proving itself the most popular unit. Suitable for most fittings. 57s. 6d. each subject. — F. W. Blanshard Ltd. (Dept. ER), Purley, Surrey (Uplands 4818/9). 52

QUARTERLY Credit Meters, single & poly-phase, 2½-100 amps. From 17/6d. Also D.C. See Television.—Tradex, Surbiton. 171

SLYDLOK fuses for sale.—Ryness Supplies, 37, Goodge Street, London, W.1. 284

ROTARY converters in stock, all sizes; enquiries invited. — Universal Electrical, 221, City Road, London, E.C.1. 34

SMALL BR screws and nuts in steel, brass and stainless steel, from stock. — Premier Screws & Repetition Co. Ltd., Woodgate, Leicester. 180

SURPLUS 400-volt, 3-phase slipring M.V. motors: 2 20 h.p., 960 r.p.m; 2 15 h.p., 1,440 r.p.m. Offers—Judd, 307, Norwood Rd., Southall. 9342

TELEVISION slotmeters & Time Switches. Details from: Tradex Meter Co., Surbiton. Elmbridge 4487. 172

TRANSFORMER, 2,000 kVA, 3-phase, 11 kV/3.3 kV. Rectifier, 300 kW, input 11 kV/3.3 kV, 3-phase, output 500 volts D.C. —John Sanger & Co. Ltd., 89, Weoley Park Road, Birmingham (Tel. SEL. 2056). 9343

TWO nearly new 350/400-kVA condensing geared steam turbo sets, 150/200 lb. pressure, stainless blading, self-contained condensers, 400 volts, 3-phase, 50 cycles, and control equipment. Standby sets, never put into commission. —Box 3200.

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WARD Leonard motor generating sets, all sizes.—Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, London, N.1 (Tel. Clerkenwell 5512). 10

2 Brush 200-kVA oil-cooled transformers with tappings, 6,600/416 volts, 3-phase, 50 cyc.; 1 Reyrolle type C, floor mounting, oil-immersed T.P. circuit breaker, 6,600 volts, 3-phase, 50 cycles, 20 amps., fitted with o/l releases; 1 ditto, rating 30 amps. All in first-class order.—J. J. Williamson & Sons (Canterbury) Ltd., St. Mildred's Tannery, Canterbury. 9327

20-kVA transformer, 400 v., 3-phase to 230 v., 50 c/s, oil filled, perfect, £25 ex works.—E. P. E., 66, Grove Road, Eastbourne. 3166

55-h.p. variable speed commutator motor with auxiliary slipring barring motor and full automatic control gear, suitable for printing press or paper/rubber calender. — Electrical Drive Applications Ltd., 103a, Farringdon Road, London, E.C.1. 3220

400-cycle to 1,500-cycle motor alternators and alternators.—Britannia Mfg. Co. Ltd., Britannia Walk, London, N.1. 27

EQUIPMENT FOR HIRE

GENERATING set hire service. Consult the most experienced firm for A.C. and D.C. units from 2 kW to 240 kW, diesel or petrol, stationary or mobile, sale or hire. 24-hr. breakdown service. — Dawson-Keith Ltd., Hillview Rd., Sutton, Surrey (Fairlands 4401). 46

RELIABLE, self-contained diesel electric generating sets for hire, 2.5 to 260 kW. Night and day maintenance service. Quotations by return. — Whitetrade Limited, Rochester, Kent (Tel. Chatham 41133, 3 lines). 294

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HARRINGTON & Sons, reclamation contractors, want redundant A.C./D.C. electric motors and transformers, stocks of cable, etc. — 109, Beaconsfield Street, New Beckton, East Ham, London, E.6 (ALB. 1388). 315

SURPLUS laminations, enamel copper wire, screws, nuts, flex. Good prices paid. Full details to—Box 199.

WANTED, D.C. and A.C. ball-bearing motors, motor generator sets, dynamos and alternators. Full details to — Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, London, N.1. 13

WANTED for prompt cash, ferrous and non-ferrous scrap, also plant for dismantling. Buyers of secondhand machinery and plant for re-use.—W. & H. Cooper Ltd., 176, Brady St., Bethnal Green, London, E.1. 120

WANTED, diesel engines and diesel sets.—H. Murfet, Daleside Rd., Nottingham. 240

WANTED, modern alternator, 225 kW (287 kVA), 400/440/3/50 at 600 r.p.m., with exciter and control gear. — Fyfe, Wilson & Co. Ltd., Station Works, Bishop's Stortford, Herts. 3221

WANTED, rotary converters, any sizes.—Universal, 221 City Rd., London E.C.1. 35

WANTED, surplus stock cable, all types and sizes. We can inspect.—Box 220.

WANTED, 22-kW, 110-volt Mawdsley generators ex Lister 38/4D JP sets.—Fyfe, Wilson & Co. Ltd., Station Works, Bishop's Stortford, Herts. 3222

WANTED, 1,500-amp. (or near) circuit breaker for 400/3/50 supply. Also number dynamos or motors, 110 volts D.C., 7 amps. approx. — Fyfe, Wilson & Co. Ltd., Station Works, Bishop's Stortford, Herts. 3223

250/300-h.p. reduction gear box, 1,500/60 r.p.m., wanted.—Box 3201.

WORK WANTED AND OFFERED

A.C. and D.C. motor rewinds and repairs. Prompt service, fully guaranteed.—Edgware 5566/9; Service Electric Co. Ltd., Honeypot Lane, Stanmore, Middx. 92

DRAUGHTING work required. All types of draughting work undertaken by two qualified electrical and mechanical draughtsmen. —Box 9338.

SMALL armature, stator, transformer and general coil winding undertaken on production run.—Kensal Electrics Ltd., 151, Kensal Rd., London, W.10 (LAD. 4530). 202

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LEADING manufacturers of relays, timers, liquid and solid level controls, etc., wish to appoint a new agent for East Anglia, and invite applications from qualified electrical sales agents. Please write, giving full and customary particulars, to—Box 3183.

WELL-known conduit fittings manufacturers have agency available to suit man having connections with electrical wholesalers in the South-West. Depot and stocks established. Write in first instance giving details to Sales Manager.—Box 3197.

BUSINESS OPPORTUNITIES

MANUFACTURERS of quality fluorescent fittings, tubes, starters and control gear wish to contact quantity buyers, wholesalers, agents, etc., interested in purchasing in quantity at special low prices. Advertisers are interested in long or short term arrangements.—Box 213.

REQUIRED, engineering firm, mechanical and electrical, to take over old-established electric welding plant manufacturers, principal retiring, turnover £8/10,000, capital required £1,000. Heavy section plant, engine and large motor-generator type.—Box 3109.

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ELECTRICAL and mechanical repair business for sale.—Box 3060.

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LEARN electrical engineering the practical way. Our new self-study course includes equipment on which experimental work can be carried out. Also courses for all professional examinations. Free brochure from E.M.I. Institutes, Dept. ER57, London, W.4 (Associated with H.M.V.). 318

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"RADIO Circuits: Step-by-Step Survey of Superhet Receivers." 3rd Edition. By W. E. Miller, M.A. (Cantab.), M.Brit.I.R.E., Editor of "The Wireless and Electrical Trader." Although this book deals mainly with the superhet receiver it is equally applicable to the straight set. The circuit of the superhet is dealt with section by section up to the complete receiver. 5s. net from all booksellers, or 5s. 9d. by post from Iliffe & Sons Ltd., Dorset House, Stamford Street, London, S.E.1. C10

COMPANY MEETINGS

THOMAS BOLTON & SONS LIMITED

Mr. F. Waine's Confidence in Long-term Outlook

THE 56th Annual General Meeting of Thomas Bolton & Sons, Limited was held on 16th April at Froghall, North Staffordshire, Mr. F. Waine, J.P. (the Chairman) presiding.

The following is an extract from his circulated statement :—

Profit on Trading and Sundry Receipts shows a reduction of £207,750 at £241,364. This is due to the pressure of more competitive conditions, increases in costs not recovered in selling prices, and more especially to the reduced volume and profitability of the sales of sulphate of copper. In addition to other charges we have written off £32,973 from an investment we made some years ago for the safeguarding of supplies of certain essential raw materials, the conditions relating to which have changed substantially since that time.

This leaves available a Net Profit of £71,941, a reduction of £188,407 compared with 1956. After various adjustments including provision for the proposed Final Dividend of 7½% on the Ordinary Stock, there remains a Balance to be carried forward of £259,581, an increase over the previous year of £39,969.

As the value of the copper content in sales represents almost 70% of the total, the very considerable fall in copper prices over the last two years has resulted in an appreciable reduction in total sales in 1957 as compared with 1956.

In metal products, however, tonnage invoiced has been well maintained, but on the other hand, the sale of sulphate of copper showed a substantial reduction.

In the case of the latter product, we have had to meet during the year from Continental producers, in almost all export markets, some of the toughest competition ever experienced. Consequently, the lower turnover has also been less profitable.

Our activities in the export markets continue to make progress and for this we are indebted to our agents in some seventy countries throughout the world.

Copper

In comparison with 1956, when violent fluctuations took place in copper prices, 1957 has been a year of steadily falling prices, starting at £267 10s. per ton in January and finishing at £181 10s. per ton at the end of December last. During the past two years we have had to contend with the difficulties of two simultaneous selling prices of copper. In October, 1957, however, the Rhodesian Selection Trust abandoned its stabilised price system and whilst in full agreement with the idea behind such a system, I can only say as a consumer of both R.S.T. and other copper, we welcomed, as did the majority of our customers, the return to a single price system.

Production

While the prices of the principal alloying metals utilised in our manufacturing operations followed the same trend as those of copper, other items of cost such as wages, fuel and transport charges have more than balanced the advantages obtained from these lower material costs.

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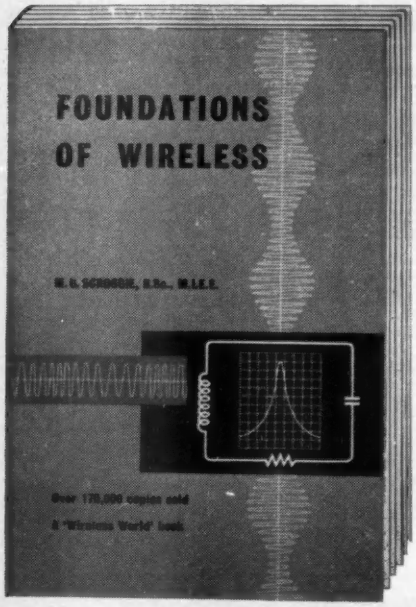

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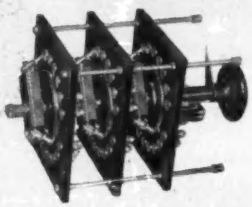

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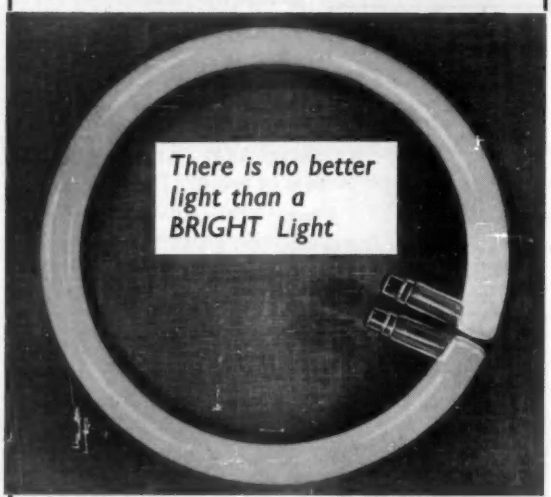

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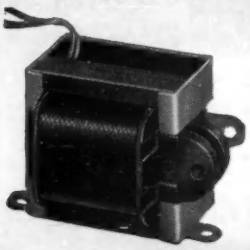

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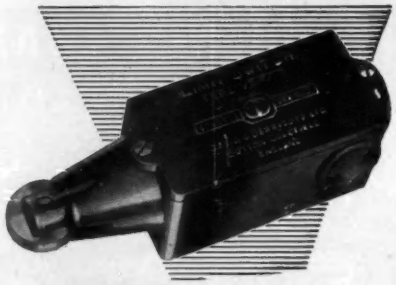

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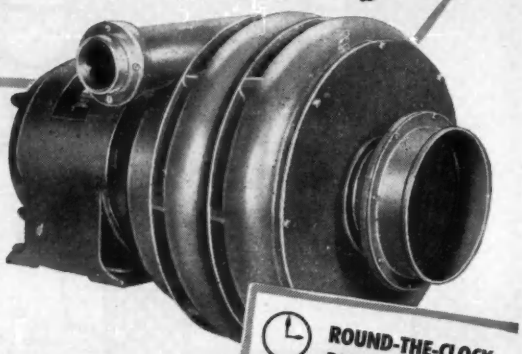

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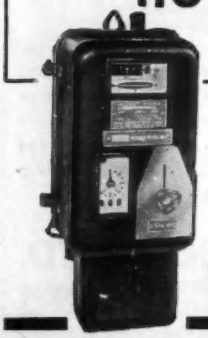

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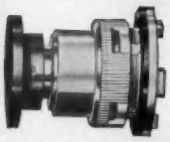

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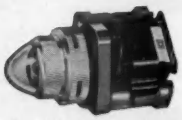

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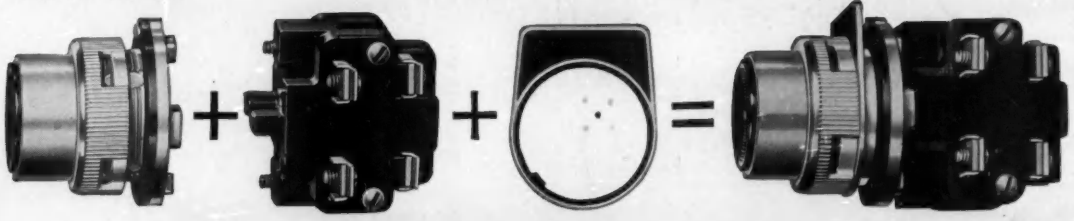

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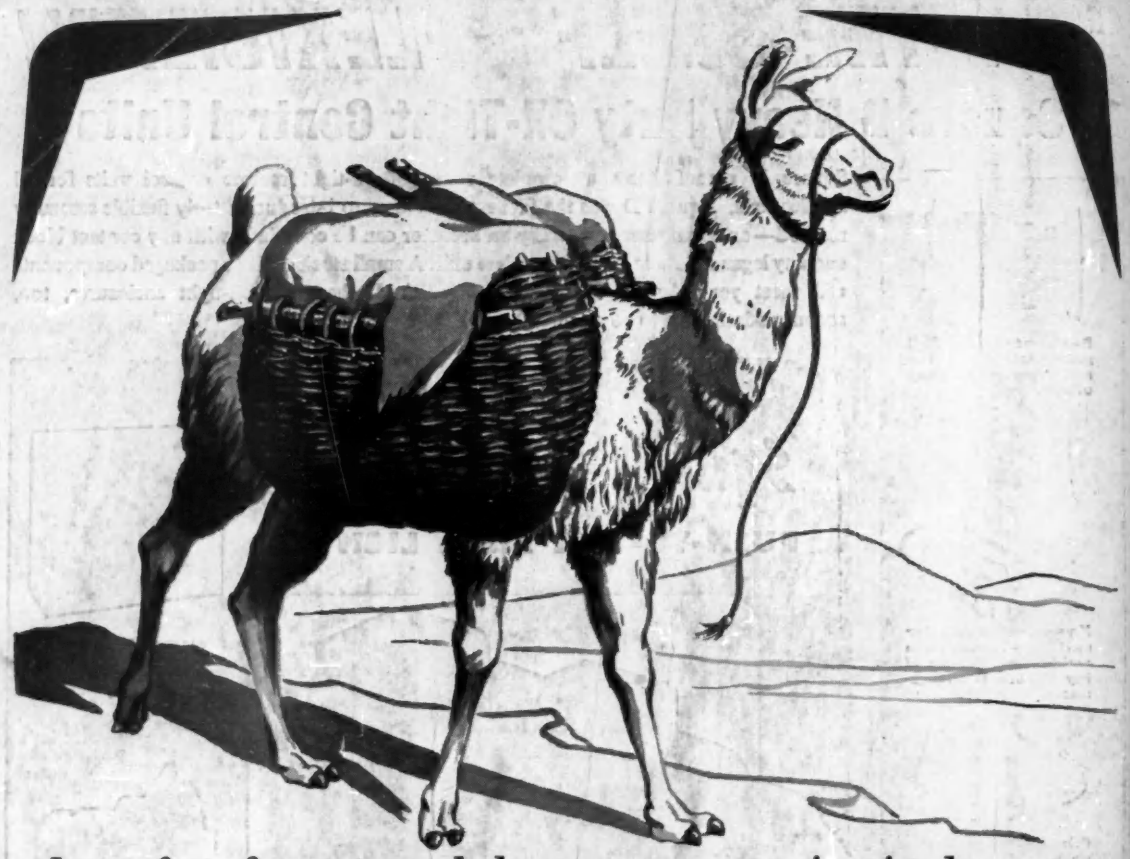

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